This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

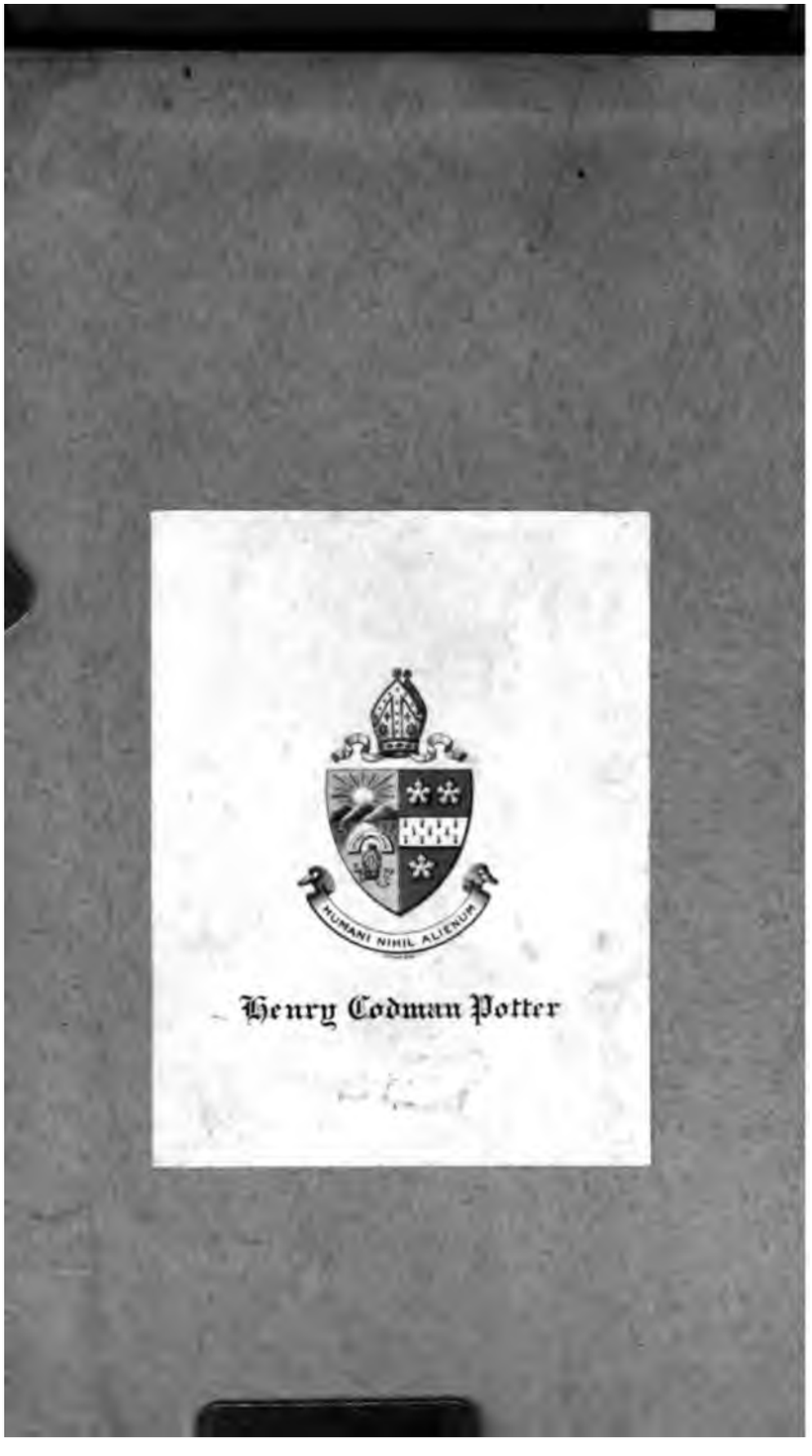
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

NYPL RESEARCH LIBRARIES
3 3433 00324242 1


HUMANI NIHIL ALIENUM
Henry Codman Potter

LIBR...

TO

SYSTEMATIC READINGS

IN THE

ENCYCLOPÆDIA BRITANNICA

BY

JAMES BALDWIN, PH.D.

Author of "The Book Lover," "The Famous Allegories," "The Book of Elegies," etc.

THE WERNER COMPANY
CHICAGO NEW YORK
1895

NEW YORK
PUBLIC
LIBRARY

THE NEW YORK
PUBLIC LIBRARY
473927
ASTOR, LENOX AND
TILDEN FOUNDATIONS.
1909

COPYRIGHT, 1895, BY
THE WERNER COMPANY.

NEW YORK
PUBLIC
LIBRARY

THE NEW YORK
PUBLIC LIBRARY
473927
ASTOR, LENOX AND
TILDEN FOUNDATIONS.
1909

COPYRIGHT, 1895, BY
THE WERNER COMPANY.

PREFACE.

ALTHOUGH the *Encyclopædia Britannica* has long been recognized as the greatest of reference works, and although its possessors may never have consulted it without complete satisfaction, yet its full value has seldom been recognized. It has usually been regarded simply as a repository of general information, to be kept ready at hand for consultation as occasion should demand. But while this is the ordinary use of the *Britannica*, it has been found that it possesses a broader function, and that it may be utilized in such manner as to perform the office of a great educational agent. The *Britannica* is a work of reference, and much more: it is a collection of all histories, all biographies, all arts, all literatures, and all scientific, professional, and mechanical knowledge; but on account of its comprehensiveness, extending as it does through so many large volumes, it presents such an "embarrassment of riches" that those who consult it fail sometimes to discover *all* that is suited to their individual needs. It is evident, therefore, that if each reader and patron of this great library can have a guide to point out to him, according to his vocation, the parts that are the most helpful to him, he will be able to systematize his reading or his investigations; and thus, while economizing

both time and labor, reach the highest results. The present volume has been prepared for that purpose; and it is believed that, recognizing its helpfulness, the many thousand owners of the *Britannica* will welcome it as an invaluable addition to their libraries. The plan has been to direct each individual how to draw from this great storehouse of knowledge that which will cover with all desirable completeness the line of work in which he is most interested, thus assisting him in the knowledge of his particular business, and aiding him in its prosecution.

It being recognized that the *Britannica* contains a great deal of interesting and profitable matter for boys and girls, the first part of this GUIDE is directed to young people. By the aid of brief but graphic text and copious references, the youth is led along pleasant avenues of research, and thus aided in acquiring a habit of reading and of investigation that will continue through life, and add largely to his chances of success.

The second part is especially designed for students. The scholar who is desirous of some means whereby to supplement the work of the school or the college, will find here the very thing that he is seeking. The earnest, ambitious young man or young woman who is being self-educated, because unable to secure the aid of instructors, will find here a teacher that will point the way to the acquirement of a thorough knowledge of almost every branch of science or art. Numerous courses of study are outlined, which may be pursued independent of schools; many profitable lines of research are suggested, and the best

ways of obtaining a fund of general information are pointed out.

The fact that fifty-two text-books used in our leading colleges and universities have been drawn from the *Britannica* emphasizes its value to students.

Through our excellent system of common schools, every boy or girl in the land is furnished with the rudiments of an education. But in the school, the child is only started on the way; the best that can be done is to provide him with a few essentials, and give him some slight impetus that will keep him moving on in the right direction. If he continues his studies beyond the public schools, he may be conducted a little farther—but it is only a little. No one's education was ever finished in a university. We are all, to a greater or less degree, self-educated. A great deal of what the schools have foisted on us as knowledge has proven to be worthless to us, and is allowed to drop from our minds as soon as we are left to ourselves. The better part of our education is that which we acquire independently—through reading, through observation, through intercourse with others—an ever increasing stock of what is called general information. It is the aim of this GUIDE to help, not only students, but everybody else, to gather this information in an orderly way, without unnecessary expenditure of time and labor.

The third part of this volume is devoted to the busy world at large. Its object is to help the busy man, no matter what his business may be, to pick out from the *Encyclopædia Britannica* just that kind of information that

will be of the greatest value to him in his calling. There is hardly a trade, industry, or profession in the civilized world that is not noticed somewhere in this department. A mere glance at the various chapters will indicate their practical value.

On the whole, it is confidently believed that the plan of using the *Encyclopædia Britannica*, as presented in this GUIDE, will fill a gap and perform an important service in our system of education. It should be a very material aid, not only to those whose school-days have been of limited duration, and who wish to continue their studies without the guidance of a teacher, but to people of every class and condition in life—to students, merchants, farmers, mechanics, housekeepers, and professional men of all sorts. It should enable boys, girls, men, women, and whole families to spend their leisure hours pleasantly and profitably with the great *Encyclopædia*, thus realizing one of its most important aims by making it the most powerful aid to home culture or self-education that the world has ever known.

CONTENTS.

		PAGE
INTRODUCTION,		11
	PART I. THE YOUNG PEOPLE.	
CHAPTER		
I.	To the Boys and Girls,	21
II.	Home Readings in History,	28
III.	Home Readings in Biography,	35
IV.	Home Readings in Science,	41
V.	Games, Sports, and Pastimes,	45
	PART II. THE STUDENT.	
VI.	Three Courses of Reading in History,	51
VII.	Five Courses of Reading in the History of Literature,	64
VIII.	Readings in Philology and the History of Language,	78
IX.	Readings in Astronomy,	83
X.	Readings in Zoölogy,	89
XI.	Readings in Botany,	98
XII.	Readings in Geography,	101
XIII.	Readings in Mathematics,	106
XIV.	Readings in the Study of Man,	111
XV.	Readings in Philosophy,	117
XVI.	Readings for Bible Students,	123

CHAPTER		PAGE
XVII.	Readings in Mythology, Legends, Traditions, and Folk-Lore,	130
XVIII.	Readings in the Study of the Supernatural,	137
XIX.	The Desultory Reader's Course,	141

PART III. THE BUSY WORLD.

XX.	The Manufacturer,	147
XXI.	The Merchant,	154
XXII.	The Banker,	158
XXIII.	The Architect,	161
XXIV.	The Builder,	165
XXV.	The Electrician,	169
XXVI.	The Mechanic,	172
XXVII.	The Machinist,	178
XXVIII.	The Engineer,	182
XXIX.	The Farmer,	185
XXX.	The Gardener,	192
XXXI.	The Fruit Grower,	195
XXXII.	The Stock Raiser,	198
XXXIII.	The Lawyer,	201
XXXIV.	The Physician,	212
XXXV.	The Theologian,	219
XXXVI.	The Public Speaker,	230
XXXVII.	The Statesman,	234
XXXVIII.	The Political Economist,	239
XXXIX.	The Inventor,	242
XL.	The Teacher,	248
XLI.	The Writer,	255

CHAPTER		PAGE
XLII.	The Printer and the Publisher,	265
XLIII.	The Journalist,	268
XLIV.	The Musician,	270
XLV.	The Artist,	274
XLVI.	The Soldier,	281
XLVII.	The Seaman,	286
XLVIII.	The Railroad Man,	290
XLIX.	The Woodsman,	292
L.	The Miner,	296
LI.	The Mineralogist,	300
LII.	The Geologist,	303
LIII.	The Chemist and Apothecary,	306
LIV.	The Home Maker,	309

INTRODUCTION.

"IT is ours—this *Encyclopædia Britannica*—and now how shall we use it in order to derive the greatest possible benefit from it?" This is probably the question which more than one purchaser of the *Britannica* asks himself as he removes the bright new volumes from their wrappings, and contemplates his lately acquired possession. Let us first arrange the twenty-odd books side by side on their shelf, and take a look at the work as a whole.

What shall we do with it?

It is the greatest work of its kind in the world, everybody says. In these volumes are the elements of a complete education in any branch of knowledge that you may choose. You cannot mention a single subject about which men think and talk, that does not receive its share of attention somewhere in this wonderful work. It contains a rich fund of information for everybody, from the school-boy or school-girl to the most learned philosopher. It is valuable alike to the farmer and the merchant, to the mechanic and the professional man. Turn over the pages of a single volume, and notice the great variety of articles, some necessarily brief, others very long and comprehensive. Notice the numerous illustrations, the maps, and the fine full-page plates. See the list of famous specialists and well-known writers who have helped to make this volume. Surely, this is a work which every man ought to be proud to own.

But unless we know how to use our *Encyclopædia*, we

direct her to some very complete courses of reading on subjects concerning which no teacher can afford to be ignorant. Is John, who cast his first ballot last year, deeply interested in politics and hopeful that he may some time become a candidate for public office? Let him devote his spare time to the study of such articles as the GUIDE indicates for the Statesman, the Public Speaker, and the Political Economist. Is Andrew skilful with tools, and handy about making things? The GUIDE has numerous interesting suggestions for the Inventor, the Mechanic, the Electrician, and the Engineer.

And so, for every person and for every occupation in life, the *Encyclopædia Britannica* comes with its inexhaustible fund of information, and this little GUIDE which accompanies it shows each individual just how he can best extract the information which he needs.

EXPLANATIONS.

References to the Britannica.

The references in the GUIDE are necessarily brief, but there will be no trouble in understanding them. The titles of important subjects are frequently printed in SMALL CAPS; but where a number of titles occur in a single list, all are printed in plain lower case letters. The volume of the *Britannica* is indicated by Roman numerals; the page by Arabic figures. Occasionally the letter *a* is used to indicate the left-hand column of a page, and the letter *b* the right-hand column—accents being added to show whether the matter referred to begins at the top, the middle, or the bottom of the column. When the page referred to is found in the American Additions and Revisions (matter which is printed as supplementary to the *Encyclopædia Britannica*), the figures denoting it are followed by the abbreviation *sup.*

EXAMPLES.—Notice the following references:

(1) Bracelets, IV. 187.

(2) Quill pens, IX. 60 a″.

(3) Sea serpent, XXI. 608 a′.

(4) Bells, 245 sup.

(5) May-day customs, XV. 647 b‴.

It is not hard to understand what each one of these references means. An examination of them, in connection with the explanations above, shows us

(1) That the article on BRACELETS is found in volume IV., page 187.

(2) That QUILL PENS are described in volume IX., page 60, beginning at the middle of the first column.

(3) That an account of the SEA SERPENT occurs in volume XXI., page 608, beginning at the top of the first column.

(4) That there is an article on BELLS in the American Additions and Revisions, page 245.

(5) That an account of MAY-DAY CUSTOMS may be found in volume XV., page 647, beginning at the bottom of the second column.

Few persons will have any difficulty in using the Index volume of the *Britannica*. In most cases, if you desire to make a complete study of any given subject, it will be best to look for that subject at once in the Index volume. The word which you are looking for will probably be found in its proper alphabetical place. There you will be directed to every article or passage in the *Britannica* wherein any important mention of the subject occurs. The first reference is usually to the special article upon the subject, or if there is no special article, it will direct you to the next best thing—the fullest or most complete description. For example, suppose you want to learn all about the Indians. Turn to the

The Index Volume.

tionary will often prove to be of great service. It is one of the most complete dictionaries of its kind ever published, containing the names of more than twenty-five thousand persons, with their titles or vocations, and the dates of birth and death. Further particulars with regard to most (but, of course, not all) of these individuals may be found by referring to the Index, which will point out the exact place in the *Britannica* where the desired information is given.

PART I.

THE YOUNG PEOPLE.

CHAPTER I.

TO THE BOYS AND GIRLS.

"Now, my young friends, this habit of reading is your pass to the greatest, the purest, and the most perfect pleasures that God has prepared for his creatures. But you cannot acquire this habit in your old age; you cannot acquire it in middle age; you must do it now, when you are young. You must learn to read, and to like reading now, or you cannot do so when you are old."—*Anthony Trollope.*

ALLOW me to introduce you, boys and girls, to the *Encyclopædia Britannica*. It is, without question, the greatest book of its kind that has ever been published in our language. Here we have it in over a score of huge volumes, with thousands of illustrations and hundreds of maps and diagrams. The amount of matter which it contains is so great that it would take you several years to read it through.

The Britannica.

But it is not intended that anybody shall read it through. It would be extremely foolish for you to begin with the first page of the first volume, and try to read everything in the order in which it comes. It would be like sitting down at a table loaded with delicacies and trying to eat everything from the first dish to the last, without considering either your tastes or your needs. No person in his right senses would think of doing such a thing. You will readily understand, therefore, how important it is that you should know, at the very outset, what this famous book is, and how it ought to be used in order that it may be of the greatest possible assistance and value to you.

What is an encyclopædia ?

It is a book which treats of all the various kinds of knowledge. In other words, it is a book which contains some information concerning everything that can be learned by man in this life. If you could know the whole encyclopædia by heart, you would be a very learned person, indeed. But, of course, this is impossible ; and it would be very unwise for you to think of becoming a great scholar in that way. You do not want to make a walking encyclopædia of yourself.

What is it ?

Does the carpenter carry his chest of tools around on his back while he is at work ? Of course not. But he knows where the chest is, and he knows just where each tool is placed in it, so that he can lay his hands upon it in a moment, even though his eyes should be shut. So it should be with your encyclopædia. You don't want to load your mind with the millions of facts which it contains, and burden your memory with the retention of them all. But you want to know your encyclopædia so well that when it is desirable to lay hold of a certain fact, you can do so without loss of time, and without unnecessary labor.

How to use it.

Again, among the great variety of tools which the carpenter has in his chest, there are some which he uses very often, there are others which he needs only on special occasions, and there are still others which, being required for only the very finest work, may not be called into use more than once or twice for years at a time. But it is necessary to have all these tools, and to know how to handle them, for there is no telling when they may be called for. And so it is with your encyclopædia. Some of its articles will be helpful to you, day by day, as you carry on your studies at school or your work at home. Others are, at

the present, of no interest whatever to you. Indeed, you will find not a few that are wholly incomprehensible to you. But that which is of no use to-day may be just the thing that you will need a year, two years, or five years from to-day; and the articles which you cannot now by any means understand may contain exactly what you will enjoy and be profited by when you are a little older. And so it will be a good thing at the outset to confine your inquiries and your readings to those subjects which are the easiest for you and in which you will naturally be the most deeply interested.

Now, here are some curious things which you may like to read about. They have been selected at random from among hundreds of others that will from time to time be suggested to you.

Curious Things.

The Bo-tree (the oldest tree in the world), 320 sup.

The Banyan tree, III. 348.

Great trees of California, IV. 704.

The Upas tree, XXIII. 859.

Pygmies (famous little people of Africa), XX. 120.

Gipsies, X. 611. This is a long article, and a part of it may not be interesting to you; but you will certainly like to read the section which describes their modes of life, X. 616.

Magic mirrors, XVI. 501.

Poison rings, XX. 561.

Ancient bottles, IV. 167.

Famous bells, 245 sup.

Bracelets, IV. 187.

History of fans, IX. 27.

Quill pens for writing, IX. 60 a″.

Flags, in ancient and modern times, IX. 276.

The sea serpent, XXI. 608 a′.

The thugs of India, XXIII. 326.
Wax figures, XXIV. 460.
Spinning in old times, XXIV. 730.
Egyptian, Greek, and Roman months, IV. 665 a″.
Wild horses of India, XII. 741.
The roc (monster bird of the *Arabian Nights*), XX. 611.
The honey guide (a curious little bird), XII. 139.
The cockatrice, VI. 98.
The hunters and the glutton, X. 696 b′.
The ichneumon, XII. 629.
The custom of April Fool, II. 214.
May-day customs in old times, XV. 647 b‴.
The Nile festival in Egypt, VII. 727 a‴.
The ordeal of fire in the Middle Ages, XVII. 820.
Deodands, VII. 100.
The divining-rod, VII. 293, and XI. 549.
The automaton, III. 142 a‴.
The hornbook, XII. 170.
The diving-bell, VII. 294–300.
Balloons, I. 187.

Heroes.

Every young person likes to read about heroes and deeds of heroism. The *Britannica* tells of a great number. A very interesting course of reading may be made up from the following and similar subjects:

Leonidas, king of Sparta, who with three hundred men, defended a mountain pass against the entire Persian army, XIV. 462.

Cincinnatus, who was called from his plough to be dictator of Rome, V. 784.

Horatius Cocles, who defended the bridge across the Tiber, and thus saved Rome, VI. 100.

Regulus, the Roman who suffered death rather than break his word, XX. 348.

William Tell, the mythical hero of Switzerland, XXIII. 155.

Arnold Winkelried, the Swiss patriot, XXIV. 612.

Jeanne D'Arc, the heroine who saved France from the English, XIII. 695; IX. 550.

Captain John Smith, famous in the early history of Virginia, XXII. 173; XV. 301.

Then there are scores of interesting articles about kings, warriors, and statesmen, some of which you will want to read. The following are examples:

Kings and Warriors.

Alexander the Great, I. 480.
Hannibal, the Carthaginian general, XI. 441.
Julius Cæsar, the greatest of the Romans, IV. 633.
Tamerlane the Tartar, XXIII. 399.
Charlemagne, V. 402.
Alfred the Great, I. 506.
William the Conqueror, XXIV. 574.
Richard Coeur de Lion, XX. 539.
Peter the Great of Russia, XVIII. 698.
George Washington, XXIV. 387.
Napoleon Bonaparte, XVII. 192.

Or, if you would read of discoverers and adventurers, see such articles as these:

Discoverers and Adventurers.

Prince Henry the Navigator, XI. 672.
Columbus, VI. 171.
Hernan Cortes, VI. 441.
Francisco Pizarro, XIX. 159.
Ferdinand Magellan, XV. 197.
John and Sebastian Cabot, IV. 622.
Sir Francis Drake, VII. 389.
Vasco da Gama, X. 57.

Captain Cook, VI. 330.
Henry Hudson, XII. 332 a.
Ibn Batuta (14th century), XII. 607 b.
Marco Polo, XIX. 404.
African Explorations, I. 245.
Henry M. Stanley and the recent discoveries in Africa, 1458 sup.
Arctic Explorations and Discoveries, II. 133.
Sir John Franklin, IX. 719.
Martin Frobisher, IX. 791.
Australian explorers, III. 104.

Then aside from this mere reading for pleasure or ordinary information, you will want to learn from time to time how a great many things are done. The *Britannica* will help you. For example, notice the following:

How to do Things.

How to make liquid glue, X. 134 a.
How to do gold gilding, X. 594 a.
How to tie knots, XIV. 128 a.
How to make gold lacquer for brass work, XIV. 194 a.
How to make snow-shoes, XXII. 201 b.
How to make photographs, XVIII. 214 b.
How to do sleight of hand tricks, XIV. 414.
How to collect butterflies, IV. 597 b.
How to make a cheap farm bridge, 343 sup.
How to make putty, XX. 18 b.
How to build an ice house, XII. 615 a.
How to shoe a horse, 858 sup.
How bells are made, III. 537 a.
How matches are made, XV. 624.
How to do with a magic lantern, XV. 211.
How nets are made, XVII. 359.
How to make flies for trout fishing, II. 40.

How pins are made, XIX. 97.
How a marble statue is made, XXI. 571.
How to make a canoe, IV. 811.
How to rig a ship, XXI. 593.
How to care for hunting hounds, XII. 315.
How to make bows and arrows, II. 376 a.
How to catch fish with a hook, II. 32.

And now don't you begin to see what a vast amount of entertaining and useful knowledge lies before you in these volumes, ready for you to use when you choose?

In the chapters that are to follow, an effort will be made to classify a few of the subjects which will be of most interest to you. In this way the GUIDE hopes to help you to a still further and more intimate acquaintance with the contents of the *Britannica*. If you once acquire the habit of consulting it, you will find it a trustworthy friend, ready to answer your questions and willing to help you on all occasions.

The Index volume of the *Britannica* will be of great assistance to you in making references to any of the other volumes. When you want to find out anything about a given subject, it is often a good plan to turn at once to that volume. If you do not know how to use the Index, refer now to page 16 of this GUIDE, and read the directions that are given there.

CHAPTER II.

HOME READINGS IN HISTORY.

"The use of reading is to aid us in thinking."—*Edward Gibbon.*

TO KNOW one thing well is better than to have a smattering of many things. It is an excellent plan to choose for yourself some particular subject which you like, and then to follow a systematic course of reading on that subject until you have acquired a comprehensive knowledge of it. Some of you will prefer history, some of you biography (which is really a branch of history), some of you science, and some of you art. In beginning such a course read that which you can readily understand; you will gradually become able to understand and enjoy things which now seem very hard and totally unintelligible to you. It is not intended that a course of this kind should take the place of the miscellaneous reading which you will want to do—of the stories, the poems, the sketches, the many excellent and beautiful things in literature which every intelligent boy or girl takes delight in reading. The aim and object of this course is to add to your knowledge, to aid you in thinking, to help you to become an intelligent man or woman. Having once decided to begin it, resolve that nothing shall induce you to neglect it. Devote a little time to it regularly. If you give ten minutes every day to systematic reading—and you need not give more—you will be astonished at the end of a year to note how many things you have learned. But if you find the reading pretty diffi-

Courses of Reading.

cult now and then, you must not give up on that account. The hardest reading is very often the most profitable—provided always that we make ourselves the masters of it.

There are a great many articles in the *Britannica* which may be utilized in courses of reading of this kind. If the *Britannica* is the only book to which you have access, these articles may be made to comprise a complete course in themselves. But if there are at hand other books on the same subject, then the readings from the *Britannica* may be made to supplement your study of these other authorities. For instance, let us suppose that you have undertaken to learn all that you can about United States History. Perhaps you have studied a text-book on that subject at school. Did it seem dull and dry to you? Perhaps the writer has made it so by trying to compress a great amount of information into a very small space. He has given a large number of dates and names, and you have been expected to learn these and remember them.

What is History?

But history in the true sense of the word is a good deal more than dates and names. It is a fascinating story, and people read it because of the pleasure which it gives no less than for the profit which may be derived from it. Take now your school history and supplement the lessons which it contains with readings from the following articles in the *Britannica:*

The story of Columbus, VI. 171.

The life of Cortes, the conqueror of Mexico, VI. 441.

Discoverers and Colonists.

The life of Pizarro, the conqueror of Peru, XIX. 159; and a particular account of his exploits in Peru, XVIII. 677.

The life of Balboa, the discoverer of the Pacific Ocean, III. 273; and a particular account of his great discovery, X. 182.

of boats and ships in volume XXI., page 804. Among the earliest war ships of which we have any account

Ships.

are the Greek and Roman triremes, described on page 806 of the same volume. In the article on the NAVY, XVII. 279, there is an interesting account of the early war ships used by the English. King Henry VIII. is said to have laid the foundation of the British navy, and the largest ship of his time, the *Great Harry*, is described, XVII. 281. Queen Elizabeth called together the greatest naval force that had ever been known, in order to oppose the Invincible Armada of Spain. The story of the ARMADA and of its notable defeat is told in an interesting article on page 543 of volume II. And in this connection you will want to read about Sir Walter Raleigh, XX. 262, about Sir Francis Drake, VII. 389, and about Sir John Hawkins, XI. 535.

But it is not expected that this course of reading shall be exhaustive; and so you may turn now to the life of Nelson, XVII. 321; to the battle of the Nile, I. 52; and to the battle of Trafalgar, VI. 146.

Next, read about our own naval heroes:

Paul Jones, XIII. 738.

Commodore Decatur, XXIII. 760; also 554 sup.

Commodore Perry, 1222 sup.

Admiral Farragut, IX. 41.

Finally, by way of concluding this brief course of reading, you will find it profitable to learn all that you can about the UNITED STATES NAVY, XXIII. 828, and particularly our new navy, its wonderful armament and its estimated strength, 1113 sup.

THE ROMANCE OF HISTORY.

1. There are many things connected with the history of the Middle Ages which give to it the charm of romance.

Tales of Knighthood.

We never tire of reading about the KNIGHTS of chivalry, XIV. 110; about the CASTLES in which they lived, V. 197; about the TOURNAMENTS which they held, XXIII. 489; and about the CRUSADES, in which they engaged, VI. 622.

Next, let us read the legend of Roland, the peerless knight of France, XX. 626; the history of Richard the Lion-hearted, XX. 539, and particularly of his exploits in Palestine, VI. 628; the story of the English outlaw, Robin Hood, XX. 605; the account of Godfrey of Bouillon, VI. 624; the history of the Children's Crusade, VI. 627; and, finally, the story of Chevalier Bayard, the knight "without fear and without reproach," III. 457.

When you have mastered this course of reading, you will have a better knowledge of mediæval life and manners and traditions than you could ever have acquired merely by studying an ordinary text-book at school.

2. A second course—equally interesting, but somewhat harder, and, therefore, suited to older readers—may be taken from ROMAN HISTORY. Read the legendary story of Romulus, the reputed founder of the city, XX. 840; the mythical tale of the Horatii and Curiatii, XII. 160; the account of Horatius Cocles, the hero who kept the bridge, VI. 100; of brave Regulus, who never broke his word, XX. 348; of Cincinnatus, called from his plough to defend his country, V. 784; of Cornelia, the mother of the Gracchi, VI. 421; of the Gracchi themselves, and of their services to their country, XI. 25; of Hannibal, the Carthaginian hero, XI. 441; and of Cæsar IV. 633, and Pompey, XIX. 451, and the downfall of the Roman republic, XX. 763.

Stories of Rome.

3. The third course is not historical, but entirely mythical or legendary, and yet there is, doubtless, some sort of

historical basis for it. It relates to the story of the TROJAN WAR—an event immortalized by Homer, the first of the poets, and made the subject of many a tale and poem and tragic drama from his time until now. As the basis and starting-point of this course, read the Legend of Troy, XXIII. 582; then refer to the following articles in their order:

Story of Troy.

Paris, whose perfidy was the cause of the war and the ultimate ruin of his country, XVIII. 295.

Helen of Argos, the most beautiful woman in the world, XI. 629.

Menelaus, the wronged husband of Helen, XVI. 10.

Agamemnon, "king of men" and leader of the Grecian forces, I. 273.

Odysseus, the wily hero, chief actor in Homer's Odyssey, XVII. 729.

Achilles, whose wrath and its consequences form the subject of the Iliad, I. 94.

Hector, the bravest and ablest of the Trojan chiefs, XI. 609.

Ajax Telamon and Ajax Oïleus, typical heroes and leaders of the Greeks, I. 432.

And now, if you have become interested in stories of this kind, turn to page 132 of the GUIDE and find there an extensive list of Greek legends and other romantic tales, all of which are narrated with more or less fulness in the pages of the *Britannica*.

CHAPTER III.

HOME READINGS IN BIOGRAPHY.

" Lives of great men all remind us,
We can make our lives sublime,
And, departing, leave behind us
Footprints on the sands of time."

—*Longfellow.*

THE biographies of great, and especially of good men, will always be found instructive and useful to the young. Some of the best are almost equal to gospels. They teach high living, high thinking, and energetic action. They show what it is in the power of each to accomplish for himself. No young man can rise from the perusal of such lives without feeling his whole mind and heart made better, and his best resolutions strengthened. They increase his self-reliance by fortifying his views and elevating his aims in life. Sometimes, too, a young man discovers himself in a biography, as Correggio felt within him the risings of genius on contemplating the works of Michael Angelo. "And I, too, am a painter!" he exclaimed. Benjamin Franklin was accustomed to attribute his usefulness and eminence to his having in youth read a work of Cotton Mather's. And Samuel Drew avers that he framed his own life, and especially his business habits, on the model left on record by Benjamin Franklin. Thus, it is impossible to say where a good example may not reach, or where it will end, if indeed it have an end.

Uses of Biography.

But, to be more precise, it may be well to name a few biographies that will illustrate the more desirable elements of character. For instance the most striking lessons of

DILIGENCE, APPLICATION, AND PERSEVERANCE

are to be found in the lives of certain famous men about whom no one can afford to be ignorant. Read, therefore, the following biographical sketches:

Men of Diligence.

Benjamin Franklin, the studious printer's apprentice, who became the first philosopher of America, IX. 711.

Washington Irving, the "father of American literature," XIII. 372.

Arthur Wellesley, Duke of Wellington, the leader of the victorious armies at Waterloo, XXIV. 493.

Michael Faraday, the distinguished scientist, IX. 29.

James A. Garfield, the canal-boy, who became President of the United States, 736 sup.

Richard Cobden, the English political economist and reformer, VI. 85.

Hugh Miller, the stone-cutter of Cromarty, who attained distinction in both science and literature, XVI. 318.

Sir Isaac Newton, the son of a small farmer, who through his industry became the foremost philosopher of modern times, XVII. 438.

Buffon, the French naturalist, who declared that "genius is patience," and whose rule was to turn every moment to account, IV. 444.

Daguerre, the inventor of the daguerreotype, and the real founder of the art of photography, VI. 761.

Gainsborough, the son of a cloth-worker, who became one of the greatest of English painters, X. 15.

General Grant, who rose from obscurity to be one of the

most suceessful military leaders of modern times, 774 sup.

Then there have been men who, in the face of

POVERTY, SICKNESS, OR DISASTER,

won their way to success and distinction. Read the story of their lives, and learn that to the boy or man of determination and will, there is no such thing as failure. Among scores of such men, it is necessary to mention only a few.

Men of Determination.

Palissy, the potter, whose life reads like a romance, XVIII. 186.

Galileo, who continued his scientific pursuits even after blindness and old age had come upon him, X. 30.

Elihu Burritt, "the learned blacksmith," who, in the odd moments of his business, made himself the master of forty languages, 372 sup.

Thomas Carlyle, the son of a mason, who, by his own perseverance became one of the most famous men of modern times, 406 sup.

John Bunyan, who wrote the "Pilgrim's Progress" while in prison, and at the same time supported his family by making tag laces, IV. 526.

Sir Richard Arkwright, who worked his way from a barber's shop to be the inventor of the spinning jenny and the founder of the cotton industry in Great Britain, II. 540.

Samuel Drew, who rose from the shoemaker's bench to be a distinguished essayist and preacher, VII. 469.

Sir Humphry Davy, the distinguished philosopher, who worked his way up from the position of a country apothecary, VI. 845.

George Stephenson, the colliery engine-man, who invented the railway locomotive, XXII. 537.

Andrew Johnson, the tailor's apprentice, who became President of the United States, XIII. 719.

For examples of

ENERGY, PROMPTITUDE, AND HARDIHOOD,

look into the biographies of such men as the following:

Men of Energy.
- Napoleon Bonaparte, XVII. 192.
- Peter the Great, XVIII. 698.
- Saladin, XVI. 588.
- Francis Xavier, XXIV. 716.
- Lord Clive, VI. 8.
- Oliver Cromwell, VI. 597.
- Andrew Jackson, XIII. 533.
- Robert E. Lee, XIV. 399.
- Henry M. Stanley, 1458 sup.

For interesting illustrations of the manly qualities of

PATIENCE AND FORTITUDE UNDER REVERSES,

study the lives of such noted men as

Men of Patience.
- Christopher Columbus, VI. 171.
- John Hampden, the English patriot, XI. 428.
- Dante, the great Italian poet, VI. 809.
- Sir Walter Raleigh, XX. 262.
- Louis Kossuth, the Hungarian patriot, 956 sup.
- James Watt, the inventor of the steam engine, XXIV. 412.
- James Audubon, the famous American ornithologist, III. 70.
- Layard, the discoverer and excavator of the ruins of Nineveh, 979 sup.
- William Harvey, the discoverer of the circulation of the blood, XI. 502.
- Claude Lorraine, the pastry-cook's apprentice, who became one of the most distinguished of the painters of France, V. 814.

John Flaxman, the famous English sculptor, IX. 298.

If you would like to read of pleasant instances of

CHEERFULNESS AND EQUANIMITY OF TEMPER

under every variety of fortune, turn to the lives of men like

Men of Cheerfulness.

Dr. Samuel Johnson, XIII. 719.
Oliver Goldsmith, X. 760.
Sydney Smith, XXII. 177.
Lord Palmerston, XVIII. 193.
Abraham Lincoln, XIV. 658.

Very interesting and valuable also are those lessons of

INTEGRITY AND UPRIGHTNESS OF PRINCIPLE

that are shown in the careers of

Men of Integrity.

Diogenes, the Greek philosopher, VII. 245.
Edmund Burke, the English orator, IV. 538.
Dr. Thomas Arnold, head master of the school at Rugby, II. 626.
Sir Thomas More, the English statesman, XVI. 815.
John Howard, the philanthropist, XII. 319.
William Chambers, the Scottish publisher, V. 380.
Loyola, the founder of the society of Jesuits, XV. 31.
William Wilberforce, the opponent of the slave trade, XXIV. 565.
"Stonewall" Jackson, the Confederate general, XIII. 534.

If you would learn of the rewards which follow

METHOD, PRECISION, AND PAINSTAKING,

read the biographies of

Men of Precision.

Nicolas Poussin, the French painter, XIX. 649.
Michel Angelo, the great Italian artist, XVI. 229.
Baron Cuvier, the French naturalist, VI. 740.
Titian, the Italian painter, XXIII. 413.
William Wordsworth, the poet of nature, XXIV. 668.

Lord Brougham, lord chancellor of England, IV. 373.
Alexander Pope, XIX. 481.
William Cecil, Lord Burghley, Queen Elizabeth's prime minister, V. 283.
Benjamin Disraeli, Lord Beaconsfield, VIII. 367.
And for the supreme lessons of purity of life and

NOBILITY OF MOTIVE

examine the lives of such men as

Men of Noble Motives.

General Lafayette, XIV. 201.
William Lloyd Garrison, X. 85.
Horace Greeley, XI. 160.
John G. Whittier, 1627 sup.,

and other illustrious persons of our own and foreign lands.

Some we have here named might be catalogued, indeed, as types of every excellence that should adorn human character. Such are our own Washington and Benjamin Franklin, but even the youngest student will see how hard it is to attempt a biographical classification on these lines.

CHAPTER IV.

HOME READINGS IN SCIENCE.

"To neglect all the abiding parts of knowledge for the sake of the evanescent parts is really to know nothing worth knowing."—*Frederick Harrison.*

THE subject of history is not equally attractive to all young people. There are some who would prefer to read of the great world of nature, and for these it would be easy to name very many *Britannica* articles which would prove interesting and instructive. Now, here is a course of readings in natural history arranged in twelve divisions, each of which can be easily completed in a month. You will find some of the articles very interesting indeed, while others, perhaps, will seem rather hard and at first not so easy to understand. But if you begin on this course and hold to it for a year, you will find not only that you have gained a great deal of information, but that the reading of these various articles has increased your capacity for deriving the highest pleasure from the perusal of books.

Natural History.

READINGS IN NATURAL HISTORY.

I. BEASTS.

The Elephant, VIII. 122.
The Giraffe, X. 618.
The Beaver and its habits, III. 475.
Monkeys, II. 148.

The Chameleon, V. 381.
The Tiger, XXIII. 385.

II. CURIOUS BIRDS.

The Albatros—the famous bird of the South Seas, I. 448.
The Dodo—a strange bird now no longer in existence, VII. 321.
The Cormorant—how it is taught to catch fish, VI. 407.
The Dove, VII. 379.
Migration of Birds, III. 765.
The Nightingale, XVII. 498.
The Stork, XXIII. 577.

III. FISHES.

The Shark, XXI. 775.
The Swordfish, XXII. 804.
Mackerel, XV. 159.
Codfish, VI. 103.
Cuttlefish, VI. 735. Goldfish, X. 759.

IV. REPTILES.

Special article, XX. 432.
Rattlesnake, XX. 293.
Cobra, VI. 90. Anaconda, I. 788.
Boa Constrictor, III. 841.
Tortoise, XXIII. 455 (illustrated).
Crocodile, VI. 592. Alligator, I. 585.

V. INSECTS.

Habits of Ants, II. 94 a.
Slaveholding Ants, II. 97 a.
White Ants of Africa, II. 99 a.
Bees and their Habits, III. 484.
An interesting description of Spiders, II. 297.

The Mantis—the curio[illegible]sut[illegible]of many wide-spread legends," XV. 503.

VI. EXTINCT ANIMALS.

The Mammoth (illustrated), XV. 447.
The Megatherium (illustrated), XV. 829.
The Plesiosaurus, XIX. 220.
The Pterodactyl, XX. 86.

VII. FABLED ANIMALS.

The Dragon, VII. 385.
The Cockatrice, VI. 98.
The Griffin, XI. 195.
The Chimæra, V. 626.
The Phœnix, XVIII. 810.
The Roc, XX. 611.

VIII. DOMESTIC ANIMALS.

History of the Horse, XII. 172.
The Arabian Horse, II. 240.
The Camel, IV. 735.
Dogs (an illustrated article), VII. 324.
Cats, V. 202.
The Cow, I. 390.

IX. SEA ANIMALS.

Ocean Life, 1159 sup.
Whales and whale fishing, XXIV. 523.
Seals and seal fishing, XXI. 580.
The Walrus (illustrated), XXIV. 337.
The Dolphin, VII. 346.
Corals, VI. 369.

X. COMMON INSECTS.

The Housefly, XII. 317.
The Humble-Bee, XII. 342.
Beetles, VI. 126.
Gnats, X. 700.
Mosquitoes, XVI, 866.
Butterflies, IV. 592.

XI. BARNYARD FOWLS.

Chickens, IX. 491.
Turkeys, XXIII. 657.
Geese, X. 777.
Ducks, VII. 505.
Pigeons, XIX. 84.
Eggs of Birds, III. 772.

XII. MISCELLANEOUS.

Special article on Birds, III. 699.
Special article on Insects, XIII. 141.
Animals of Asia, II. 695.
Animals of Africa, I. 258.
Animals of America, I. 681.
Article on Amphibia, I. 750.

Of course this list might have been made very much longer—for the *Britannica* contains hundreds of such articles. But the above will be sufficient to start with, and, as you proceed with your reading, other subjects will naturally suggest themselves which you will be able to find from the Index volume without any further help from the GUIDE.

CHAPTER V.

GAMES, SPORTS, AND PASTIMES.

" Up ! up ! my friend, and quit your books,
Or surely you'll grow double :
Up ! up ! my friend, and clear your looks ;
Why all this toil and trouble ?"—*Wordsworth.*

THIS would be but a dull world if everybody worked all the time, and never took any recreation. And the *Encyclopædia Britannica* would be a dull book if it were filled entirely with information about the different branches of scientific knowledge, and said nothing at all about the games, sports, and pastimes which amuse our leisure hours and add to the enjoyableness of life. But from these volumes you can learn how to play, as well as how to work. Every game of any importance, every pastime that is of general interest receives its proper notice.

Work and Play.

Do you want to know all about BASE-BALL, its history, the rules which govern the game, etc.? Turn to volume III., page 406, and you will find there a brief but comprehensive article on that subject, which every boy will want to study; and this is continued in a supplementary article, page 216, sup. The English national game of CRICKET is treated with equal fulness in VI. 578. Both these articles contain not only the rules most generally recognized for the government of the games, but carefully drawn diagrams of the fields, and full directions for playing.

Games of Ball.

ARCHERY is the subject of an extremely interesting article, II. 371. From that article you may learn not only the history of bows and arrows but how to make them (II. 376), and also the rules which govern the popular pastime of archery (II. 377).

Out-door Games.

Other out-door games of almost every kind are described with like completeness:

Golf, X. 765.
Lacrosse, XIV. 195.
Bowls, IV. 179.
Ten-pins, IV. 180 b'''.
Croquet, VI. 608 b.
Quoits, XX. 189.
Curling, VI. 712.
Billiards, III. 674.
Rackets, XX. 549.
Polo, XIX. 403.
Tennis, XXIII. 179.
Football, IX. 367.

All kinds of indoor games are also described, together with minute directions for playing them. The article on CHESS, V. 592, is interesting for its historical information. That on DRAUGHTS (commonly known in this country as checkers), VII. 444, and that on Backgammon, III. 197, are equally entertaining and instructive. Read the special article on GAMES, X. 63.

Indoor Games.

The article on FALCONRY, IX. 6–12, gives an account of the rearing and training of hawks for hunting purposes, and of the manner in which this once popular sport was conducted. Closely connected with this is the subject of TOURNAMENTS, the history of which is pleasantly narrated in XXIII. 489. The article entitled ANGLING, II. 32, contains a

Sports.

good deal of information about fish, and the art of taking them with hooks. Most boys will like to read about HUNTING, XII. 392, about the care of fox-hounds, XII. 315, about fox-hunting, XII, 395, and about HORSEMANSHIP, XII. 195. All sportsmen will turn with interest to the GAME LAWS of the United States, page 868, sup., and will note what is said about sportsmen's dogs—such as the setter and the pointer—VII. 328, 330.

If you ride a BICYCLE you will want to read its history, III. 665. Then the article on SKATING, XXII. 104, will claim your attention; and the practical directions for SWIMMING and diving, XXII. 768, will repay you for all the time which you devote to them. CANOEING, IV. 811, is another practical out-door article; and YACHTING, XXIV. 722–725, is one of historical interest. The special article on ATHLETIC SPORTS, III. 12, is full of valuable information, especially with reference to physical culture, although there are certain portions of it which some of the younger boys may not care to read.

After learning about the sports and games of our own times, it is natural that we should like to know how the people of former ages amused themselves, and how they trained their bodies, and cultivated their strength. Here are a few of the many articles, or parts of articles, which may be read:

Ancient Pastimes.

Greek games, X. 63 a.

Roman games, X. 65 a.

Athletae, III. 11.

The Amphitheatre, I. 774; XX. 830.

The Colosseum at Rome, II. 419.

Olympian games, V. 711; VIII. 140; XI. 94; XVII. 766.

Gladiatorial games, X. 632.

Secular games at Rome, XXI. 618.

Wrestling, X. 64.
Roman circus, V. 791; XX. 829.
Chariot racing, X. 64.

But enough has been said to give you an idea of the many interesting things about sports and amusements that are to be found in the *Britannica*. Yet it may not be amiss to close this chapter by referring the lovers of puzzles and mystery to two articles which cannot fail to supply suggestions for many a pleasant hour:

Puzzles.

Riddles, XX. 549.
Legerdemain (sleight of hand), XIV. 414; XV. 207.

PART II.

THE STUDENT.

CHAPTER VI.

THREE COURSES OF READING IN HISTORY.

"History is philosophy teaching by examples."—*Bolingbroke.*

THE entire history of man, from the earliest times to the present, will be found in the *Encyclopædia Britannica.* Many of the articles on historical subjects are chiefly valuable for purposes of reference, while others are extremely interesting when read in course, and if taken up and studied systematically will give to the student a mastery of the subject which he could not well acquire from any similar work.

It is proposed in this chapter to indicate three distinct courses of reading, any one of which can be pursued independently of the others. In laying out these courses the aim has been to select from the great abundance of material in the *Britannica* such portions as are essential to an understanding of the march of events, and to pass lightly over those periods of history which have been unprolific of events of general and permanent interest.

I. AMERICAN HISTORY.

The article AMERICA, I. 669, contains a section of twenty pages devoted to ancient America. This will serve as an excellent introduction to the course of study upon which we have entered. Here you will find a full account of the aborigines, page 686; their languages, page 688; their tribal organization, page 690; the ancient remains of the Mis-

Ancient America.

sissippi valley and other localities, page 691; an account of the native civilization, page 694; and a very interesting résumé of the curious traditional history of Central America. In the articles, MEXICO, XVI. 206, and YUCATAN, XXIV. 759, there is a still fuller exposition of this subject. In the article PERU, XVIII. 676, the remarkable civilization of the country of the Incas is described in a manner that is both pleasing and instructive.

The Discovery.

It is still, in certain respects, a debated point as to who was the real discoverer of America. In the article AMERICA, I. 706, a full account is given of the voyages of the Northmen to the shores of North America, and following this, we have the story of Columbus and his discoveries. Turn now to the biography of Columbus, VI. 170. Read, also, the life of Sebastian Cabot, IV. 622, and that of Amerigo Vespucci, XXIV. 170, who, by a singular fortune, gave his name to the New World. The conquest of Mexico is well told in the article CORTES, VI. 441, and that of Peru in the article PIZARRO, XIX. 159.

THE UNITED STATES.

General Views.

Begin with the article UNITED STATES, XXIII. 729. The first part of this article, containing seventy-two pages, embraces a history of our country which is not only more complete, but far more readable than most of the school text-books on this subject. To add to the value of the article, it is illustrated with several maps:

1. A map of the English colonies.
2. A map showing the territorial growth of the United States from 1776 to 1887.
3. A map of the United States corrected to date.

A brief analysis of this article will show us what addi-

tional subjects may be brought in by way of collateral reading.

In connection with the history of VIRGINIA, XXIII. 724, read the following articles or parts of articles:

Virginia.

Sir Walter Raleigh, XX. 262.

John Smith, XXII. 173.

History of Tobacco, XIII. 423 (one column).

Introduction of Slavery into America, XXI. 137 (beginning with "Spanish Colonies," second column, and ending at the bottom of page 138).

In connection with NEW ENGLAND, XXIII. 729, read about the Puritans, VIII. 177, and Roger Williams, XXIV. 586.

Northern Colonies.

In connection with Pennsylvania, XXIII. 730, read about William Penn, XVIII. 494.

With the REVOLUTIONARY WAR, XXIII. 739, we reach the period of those great men whom we justly style "the fathers." Let us read the biographical sketches of a few of these makers of the nation:

The Revolution.

George Washington, XXIV. 387.

Patrick Henry, XI. 676.

Thomas Jefferson, XIII. 613.

John Adams, I. 141.

James Madison, XV. 182.

James Monroe, XVI. 760.

Alexander Hamilton, XI. 412.

These articles will help us to understand not only the period of the Revolution, but the equally important periods which followed—the formation of the FEDERAL CONSTITUTION, XXIII. 744, and the beginnings of the government under the constitution, XXIII. 751.

Nullification, XXIII. 763. With this read Andrew Jackson, XIII. 533, and John C. Calhoun, IV. 683.

Slavery. Opposition to Slavery, XXIII. 765. William Lloyd Garrison, X. 85. History of Slavery, XXII. (beginning near the bottom of page 138 and continuing to the middle of the second column, page 142). Henry Clay, V. 817; Daniel Webster, XXIV. 471; Stephen A. Douglas, VII. 377.

Entering now upon the period of the CIVIL WAR and the reconstruction which followed it, XXIII. 774–784, we may read, for additional information, the articles Abraham Lincoln, XIV. 658, U. S. Grant, 774 sup., Jefferson Davis, 547 sup., and Robert E. Lee, XIV. 399.

Supplementary Chapters. Before concluding this course of reading, it will be well to notice another very important article, or rather series of articles, relating to the history of our country. Among the articles comprising the American additions and revisions to the *Britannica* there are sixty-three pages of matter, the most of which should be read, and some of it studied thoroughly. The facts there given are of interest and importance to every American citizen. Here are the headings of some of the sections:

Territories of the United States in 1776, p. 1523.
Cessions by foreign powers to the United States, p. 1524.
Declaration of Independence, p. 1527.
Articles of Confederation, p. 1528.
Earliest Congress of the United States, p. 1530.
Constitution of the United States (full text), p. 1535.
Relation of the President of the United States to the National Legislature, p. 1538.

II. ANCIENT HISTORY.

In indicating the following course of reading, an attempt will be made to cover all the more important periods of ancient history, and at the same time not to mark out

more than can be mastered within a reasonable length of time. It is possible that the reader will enlarge it at many points by reading entire articles, of which only parts are here indicated; but, whether he does this or not, he should find himself at the end of the course possessed of a good general knowledge of ancient history, of its leading characters, and its more interesting scenes and incidents.

Oriental Countries.

EGYPT.—A long and very scholarly article on this country is contained in the seventh volume of the *Britannica*. Read the following sections with special care:

Description of Egypt, page 702; its ancient inhabitants, page 713; its chronology, page 728; the Egyptian dynasties, page 730; the twelfth dynasty, page 734; the accession of Ptolemy I., page 745.

ASSYRIA AND BABYLONIA.—Read the entire article on these countries, III. 183. Read also the description of Babylon, III. 182, and of Nineveh, XVII. 511; also, the account of Jonah, XIII. 736, and that of Berosus, III. 607.

PHŒNICIA.—Read the greater part of the article under this heading, and especially the following sections: Description of Phœnicia, XVIII. 801, 802; origin of the Phœnicians, page 803; navigation, trades, and colonies, pages 804–807. Read also the articles Tyre, XXIII. 710, and Sidon, XXII. 35.

PERSIA.—In volume XVIII. of the *Britannica*, one hundred pages are devoted to Persia. The history of ancient Persia extends from page 561 to page 616. If your time is limited, begin with the section entitled Medo-Persian Empire, page 561; read the history of Cyrus, page 564, and of his successors, to the accession of Artaxerxes, page 573. The account of the expedition against Greece may be deferred until its proper place is reached in Greek history.

GREECE.—With the history of this country it is necessary to spend much more time. Begin by reading the whole of Section I.—"Greek History to the Death of Alexander the Great"—volume XI., pages 89–105. For collateral reading, see the following articles: Troy, XXIII. 58; Lycurgus, XV. 95; Sparta, XXII. 369; Greek Games, X. 64. While studying the history of Attica, XI. 95, refer to the article Athens, III. 1, and read with particular care the description given of that city by Pausanias, III. 9. Solon's account of his own work, XI. 97, is supplemented by a much fuller account in the twenty-second volume of the *Britannica*, page 253. Here, too, it will be well to read the biography of Pisistratus, XIX. 130. The events which follow the historic battle of Marathon, IX. 99, bring prominently forward the great rival statesmen, Aristides, II. 504, and Themistocles, XXIII. 250. Then follows the period of Athenian supremacy, XI. 100, and in connection with it the article on Pericles, XVIII. 529, should be read. With the Theban sepremacy, read Epaminondas VIII. 456; and, with the decay of Greek civic life, XI. 103, study the excellent article on Demosthenes, VII. 67.

Greece.

Turn, now, to the article MACEDONIAN EMPIRE, XV. 138, and read down to the account of the departure of Alexander on his great expedition against Persia. From this point, continue the story with the article Alexander the Great, I. 480. The death of Alexander, as you will learn, was the signal for the breaking up of his empire. Ptolemy, one of his generals, established himself in Egypt, VII. 745; Seleucus, another general, founded a new Persian empire, with its capital at Seleucia, on the Tigris, XVIII. 58; and Antipater, who had been made regent of Macedonia, maintained the integrity

of Greece, XV. 144. We need not follow now the history of these fragments of Alexander's great empire—their wars with one another, and their internal dissensions. A new empire was about to arise which should overpower them all.

Roman History.

ROME.—The article under this heading, XX. 731–837, embraces a complete and very interesting survey of the history of the Eternal City from its foundation in legendary times to the year 1870. Read, as a beginning, the first sixteen pages of the article, to the section entitled, "Rome and the Mediterranean States." Numerous collateral references present themselves, but, if your time is limited, they may be omitted, and the reading of the principal article may be continued. The story becomes very interesting now, and you need not be told to read it carefully. The second Punic War brings to our notice HANNIBAL, XI. 441, and the elder SCIPIO, XXI. 466. In connection with the third Punic War we shall read of the younger Scipio, XXI. 468, and of Cato the Censor, V. 239. Other collateral readings will include: Marius, XV. 549; Sulla, XXIII. 632; Cicero, V. 770; Cataline, V. 338; Pompey, XIX. 450; and Julius Cæsar, IV. 633.

These readings ought to give you a very complete knowledge of the history of Rome, in the palmy and heroic days of the Republic, as well as in the period of that Republic's degeneracy.

The story of the Empire begins on page 769, of the twentieth volume; it ends with the downfall of the Western Empire (A. D. 476), as described on page 781. Let us, however, continue our reading with the Eastern Empire, until it, too, is ended with the fall of Constantinople, A. D. 1454. We shall find this part of the story in the article GREECE, XI. 110–120. On the thread of these two articles

the following biographies, each in its proper place, may be strung:

Augustus, III. 79; Tiberius, XXIII. 335; Nero, XVII. 347; Trajan, XXIII. 502; Hadrian, XI. 363; Commodus, VI. 207; Constantine, VI. 298; Justinian, XIII. 792.

For further collateral reading, add the following articles: Goths, X. 846; Vandals, XXIV. 58; Attila, III. 61.

This course of reading embraces in the aggregate about 150 pages of the *Britannica*. By reading an hour or so regularly every evening, one may complete it in a short time; and there is no doubt but that the reader will obtain from it a far more satisfactory view of ancient history than can be gained from any of the so-called "Universal Histories." The reason is obvious: Here the subject is presented as in a painting, with a distinct background, and the foreground appropriately filled with lifelike figures. It is no mere catalogue of events that you have been studying; it is history itself.

Conclusion.

III. MODERN HISTORY.

The Mohammedan Empire.—The first part of the article, MOHAMMEDANISM, XVI. 545, relates the story of Mohammed and the first four caliphs. Read this part carefully. Then proceed to the second part, XVI. 565, which gives an account of Moslem conquest and dominion down to the capture of Baghdad by Jenghis Khan, A. D. 1258. The most important event for us during this latter period is the conquest of Spain, a full account of which may be found in the article SPAIN, XXII. 312–315.

The Arab Conquest.

Continental Europe from A. D. 476 *to* A. D. 1454.—The period of ten centuries which intervened between the fall of the Western Empire and the capture of Constantinople

by the Turks may be briefly studied. The Franks invade Gaul, IX. 528; the Goths and Lombards establish themselves in Italy, XIII. 467; the Visigoths gain control of Spain, XXII. 308; a new empire is established by CHARLEMAGNE, V. 402. This brings us to the year 814. From this point to the close of the period only a few events need be noticed: The rise of the feudal monarchy in France, IX. 536; the Hapsburg dynasty, X. 491 and III. 124; the house of Brandenburg in Germany, XX. 4. Now read the account of the Hundred Years' War between France and England, IX. 545–551. This prepares us for the study of the article on Feudalism, IX. 119, and the various notices of CHIVALRY indicated in the Index volume, page 96.

The Middle Ages.

The chief events of this period are connected with the Crusades, which are the subject of an interesting and important article, VI. 622. In connection with the above-named articles there is room for a good deal of collateral reading. Study the following articles:

Venice, XXIV. 141; Florence, IX. 333; Medici, XV. 783; Naples, VII. 191; Hanseatic League, XI. 449; and a part of the article on commerce, VI. 199–201.

From A. D. 1454 *to the French Revolution.*—Among the important events of this period were the following:

The discovery of America, X. 179–192.

The invention of printing, XXIII. 687.

Modern Europe.

The Reformation, XX. 319.

The invention of the steam engine, XXII. 473.

The study of the history of this period may begin with the RENAISSANCE, XX. 380. In connection with this study, refer to the historical portion of each of the following articles:

Austria, III. 124–131; Prussia, XX. 1–11; Holland, XII. 70–82; France, IX. 552–596.

See also Italy, XIII. 482; Spain, XXII. 339.

The portions of this history which will claim our chief attention are: The career of CHARLES V., X. 413; the struggle of the Netherlands with Spain, XII. 74–77; the Thirty Years' War, III. 125. In connection with these, read: Wallenstein, XXIV. 328; Gustavus Adolphus, XI. 333; Louis XIV., IX. 573–583; Philip II. of Spain, VIII. 743; Catherine de Medici, V. 235; Peter the Great, XVIII. 698; Charles XII. of Sweden, IV. 420; Frederick the Great, IX. 735, and Catherine II. of Russia, V. 233.

From the French Revolution to the Present Time.—The leading article for the study of this period is that on FRANCE from page 596 to page 629, volume IX. Here you may read (1) of the Revolution, page 596; (2) of the Republic, page 604; (3) of the Empire, page 615; (4) of the subsequent history of France to the close of the presidency of M. Grévy. A supplementary article, page 717 sup., brings the history of France down to date. In connection with the above, read the following biographical sketches: Mirabeau, XVI. 492; Marie Antoinette, XV. 540; Robespierre, XX. 601; Danton, VI. 815; Marat, XV. 526.

The XIXth Century.

The history of NAPOLEON fills thirty-seven pages of the *Britannica*, XVII. 192. In connection with this article, read the following: Josephine, XIII. 751; Talleyrand, XXIII. 29; Wellington, XXIV. 493.

These articles alone will give us the best part of the political history of Continental Europe down to the year 1815. The more important events which have since occurred outside of France may then be read:

The liberation of Greece, XI. 125.

The Crimean war, XXI. 102.

The unification of Italy, XIII. 466.

The Austro-Prussian war, X. 502.

The Franco-Prussian war, X. 503–506.

And now you will no longer need the help of the GUIDE. Almost any information that you may desire can be found by turning to the proper heading in the *Britannica* as indicated in the Index volume.

For events that have occurred since 1879, as well as for the biographies of men who were living at that time, it is always well to consult the American Additions and Revisions. For example, there is no separate article on Bismarck in the main portion of the *Britannica;* but in the Supplement, page 289, there is a complete biographical sketch and in the Index volume (page 57) there are references to four other articles in which he is mentioned.

The British Dominions—England.—The historical part of the article ENGLAND fills about one hundred pages (VIII. 263–367), which may be read at your odd moments of leisure. If you should wish to begin at a still earlier period, turn to the article BRITANNIA, IV. 352, where an account is given of the ancient Briton and of the occupancy of their country by the Romans previous to its conquest by the English.

Early Britain.

From these two articles alone you may obtain a good practical knowledge of English history. In connection with them, however, it will be profitable to read the following briefer articles:

English Biography.

William the Conqueror, XXIV. 574.
Richard Coeur de Lion, XX. 539.
Henry VIII., XI. 662.
Mary, XV. 592.
Lady Jane Grey, XI. 193.
Elizabeth, VIII. 142.

Sir Francis Drake, VII. 389.
Charles I., V. 404.
Oliver Cromwell, VI. 597.
William III., XXIV. 578.
Queen Anne, II. 62.
Marlborough, XV. 553.
Lord Chatham, V. 540.
Charles James Fox, IX. 494.
William Pitt, XIX. 134.

Read, also, ARMADA, II. 543, and ENGLISH COSTUMES, IV. 465.

Scottish History.

Scotland. — See an article on SCOTLAND, XXI. 471–520. Read also for the story of specially important periods in Scottish history, the following biographical sketches:

William Wallace, XXIV. 126.
Robert Bruce, XX. 592.
Mary Queen of Scots, XV.594.

Irish History.

Ireland.—The historical part of the article IRELAND, XIII. 214–272, is extremely interesting. It includes such topics as the following: Legendary history of Ireland, page 243; Scottish conquest of Ulster, page 246; early Irish church, page 248; Anglo-Norman invasion, page 258; Cromwell's campaign, page 267; James II. in Ireland, page 286; struggle for independence, page 270; Fenianism, page 271.

British Colonies.

India.—For a history of the English in India, see article INDIA, XII. 796–812. Read, also, the biographies of Robert Clive, VI. 8, and Warren Hastings, XI. 512.

Africa.—For an account of the various possessions and dependencies in Africa, refer to the Index volume, and read what is said in the *Britannica* with reference to each of the several colonies or countries. Study

especially the articles on Natal (XVII. 239) and Cape Colony (V. 44–49).

Australia.—For the history of the exploration and settlement of this continent, see AUSTRALIA, III. 103–106.

There still remain in the *Britannica*, hundreds of historical and biographical articles which have not been mentioned in this chapter. But you can find them, if need be, without the help of a guide. Having been conducted thus far along the road you will now have no difficulty in making your own way. With a little study and care you may even mark out another course of historical reading for yourself; for the *Britannica* contains the materials for very many such courses.

Other Courses.

CHAPTER VII.

FIVE COURSES OF READING IN THE HISTORY OF LITERATURE.

COURSE THE FIRST.—AMERICAN LITERATURE.

" O strange New World, that yet wast never young,
Whose youth from thee by gripin' want was wrung,
Brown foundlin' o' the woods, whose baby bed
Was prowled round by the Injun's cracklin' tread,
An' who grew'st strong thru' shifts an' wants an' pains,
Nursed by stern men with empires in their brains !"

LET us begin this study by a review of the history of our own literature, for it is in the institutions and productions of his own country that the pride and hope of every true American should be centered. "The number of writers who have acquired some amount of well-founded reputation in the United States is startling." In the course of study which we shall here offer, we can do little more than refer the student to the *Britannica's* numerous biographical sketches of American writers. The special article on AMERICAN LITERATURE, I. 718–735, written by the late Professor Nichol of Glasgow, is worthy of our careful attention; and the first two chapters of that article should be read by way of introduction to the course which we have before us. The first part of the third chapter (I. 720) will introduce us to colonial literature and the earliest American writers.

Captain John Smith, whose description of Virginia is

usually spoken of as the first American book, is the subject of a long and interesting article, XXII. 173. But Smith's book can scarcely be called literature—certainly not in the better sense of the term. The first genuine literary work performed in America was George Sandys's translation of the works of Ovid, made on the banks of the James River, and published in 1626. See the article, George Sandys, XXI. 262 (also, Ovid, XVIII. 78). Of other early writers in America, there are a few whose biographies should be studied. Read the lives of the great theologians and controversialists of colonial New England:

Colonial Writers.

Roger Williams, XXIV. 586.
John Cotton, XII. 726.
John Eliot, the Apostle of the Indians, VIII. 136.
Cotton Mather, XV. 631.
Jonathan Edwards, VII. 688.

Then turn to the article on Benjamin Franklin, IX. 711. This, with the first two columns of Chapter III, on page 720 of volume I. will complete our study of the Colonial Period.

Concerning the orators, statesmen, and poets who flourished during the REVOLUTIONARY PERIOD there is much to read; and yet of the writings of that period there remains to us but little that is of permanent literary value. Read what is said on this subject on pages 721 and 722 of the first volume of the *Britannica*. Read the articles on

Statesmen and Poets.

Patrick Henry, XI. 676.
Alexander Hamilton, XI. 412.
Thomas Jefferson, XIII. 613.
Philip Freneau, the poet, 723 sup.
John Trumbull, XXIII. 592.
Joel Barlow, III. 377.

Coming now to the literature of the NINETEENTH CENTURY, let us read first of the great historians:

Historians.
George Bancroft, 200 sup.
Richard Hildreth, 843 sup.
William H. Prescott, XIX. 702.
John Lothrop Motley, XVII. 2.
Francis Parkman, 1198 sup.

Of the orators:

Orators.
Daniel Webster, XXIV. 471.
Henry Clay, V. 817.
John C. Calhoun, IV. 683.
Edward Everett, VIII. 736.

Of writers of fiction and miscellanies:

Novelists, etc.
Washington Irving, XIII. 372.
Nathaniel P. Willis, XXIV. 587.
James Fenimore Cooper, VI. 337.
Charles Brockden Brown, IV. 383.
Nathaniel Hawthorne, XI. 536.
Oliver Wendell Holmes, 849 sup.

Of essayists and theologians:

Essayists, etc.
William Ellery Channing, V. 393.
Theodore Parker, XVIII. 300.
Ralph Waldo Emerson, 644 sup.
Henry D. Thoreau, XXIII. 313.

Of poets:

Poets.
Henry W. Longfellow, XIV. 860.
Edgar Allan Poe, XIX. 255.
William Cullen Bryant, 358 sup.
James Russell Lowell, 1027 sup.
John G. Whittier, 1627 sup.
Walt. Whitman, 1627 sup.

Read next, Chapter IV. pages 722–734, volume I.

If the student wishes to continue this course of reading so as to include a survey of our more recent literature,

with a study of the lives and works of some of the later writers, he can do so without further direction from the GUIDE. By consulting the Second part of the Index volume (pages 501–557), he will be able in most cases to find any name of real prominence in American literature. A course of reading pursued in the manner here indicated cannot fail to impart a comprehensive knowledge of the history of our own literature. If conducted in connection with the reading of extracts from the writers mentioned, its educative value can scarcely be overrated. The readings may conclude with the "Summary," I. 734–735.

Recent Literature.

COURSE THE SECOND—ENGLISH LITERATURE.

See the special article on English literature, VIII. 403. This is a long and valuable contribution by Thomas Arnold, and should be read in parts in connection with the following short articles or parts of articles:

Eleven Periods.

I. ANGLO-SAXON PERIOD, 596–1066.

The Venerable Beda, III. 480.
Caedmon, the first English poet, IV. 630.
King Alfred, I. 506; VIII. 404.
Ælfric, the Grammarian, I. 182.

II. ANGLO-NORMAN PERIOD, 1066–1215.

Romances and legends of King Arthur, V. 322; II. 649; VIII. 309; IX. 639.
Layamon (13th century), XIV. 374.
Geoffrey of Monmouth (12th century), X. 172.

III. THE TRANSITION PERIOD, 1215–1350.

Matthew Paris (13th century), XV. 633.
Duns Scotus, VII. 545.

Roger Bacon (died 1292), III. 218.
Ormin's rhythmic gospels, VIII. 395.
Robert Manning, XV. 494.

IV. EARLY ENGLISH LITERATURE, 1350–1477.

John Wickliffe, XXIV. 708.
John Gower, XI. 21.
Geoffrey Chaucer, V. 449; VIII. 411.
John Lydgate, XV. 97.
The invention of printing, XI. 336; VIII. 413.
Caxton, the first printer, V. 279; VIII. 398.

V. THE RENAISSANCE AND THE REFORMATION, 1477–1579.

Sir Thomas More, XVI. 815.
John Skelton, XXII, 119.
Henry Howard, Earl of Surrey, XXII. 694; XXIV. 704.
Sir Thomas Sackville, VII. 372.
Roger Ascham, II. 677.

VI. THE ELIZABETHAN ERA, 1579–1620.

Sir Philip Sidney, XXII. 35; XVIII. 346.
Edmund Spenser, XXII. 392.
William Shakespeare, XXI. 737.
Ben Jonson, XIII. 741.
Sir Francis Bacon, III. 200; VIII. 422.

VII. THE PURITAN PERIOD, 1620–1660.

Jeremy Taylor, XXIII. 93.
Edmund Waller, XXIV. 330.
Abraham Cowley, VI. 532.
Thomas Hobbes, XII. 31.
John Milton, XVI. 324; XIX. 267.

VIII. PERIOD OF THE RESTORATION, 1660–1700.

John Dryden, VII. 488.
Samuel Butler, IV. 588; XXI. 319.
John Bunyan, IV. 526.
John Locke, XIV. 751.

IX. THE AGE OF QUEEN ANNE, 1700–1727.

Daniel Defoe, VII. 26.
Joseph Addison, I. 146.
Alexander Pope, XIX. 481.
Dean Swift, XXII. 761; XXI. 320.

X. THE GEORGIAN ERA, 1727–1800.

William Cowper, VI. 533.
Robert Burns, IV. 566.
Richard Brinsley Sheridan, XXI. 797.
Samuel Richardson, XX. 543.
Henry Fielding, IX. 142; XXI. 320.
Laurence Sterne, XXII. 541.
Samuel Johnson, XIII. 719.
Oliver Goldsmith, X. 760.
David Hume, XII. 346.
Edward Gibbon, X. 572.
William Robertson, XX. 599.
Bishop Butler, IV. 582; I. 792.

XI. THE NINETEENTH CENTURY.

Sir Walter Scott, XXI. 544.
Lord Byron, IV. 604; XXI. 320.
Percy Bysshe Shelley, XXI. 789.
Robert Southey, XXII. 289.
William Wordsworth, XXIV. 668; XIX. 271.
Samuel Taylor Coleridge, VI. 135.

John Keats, XIV. 22.
Alfred Tennyson, 1485 sup.
Robert Browning, 354 sup.
Charles Dickens, VII. 173.
William M. Thackeray, XXIII. 214; XXI. 320.
George Eliot, 529 sup.

COURSE THE THIRD—ANCIENT LITERATURE.

1. *Greek Literature.*—The article on Greek literature, XI. 136, is a comprehensive sketch of the literary development of Greece, showing how its successive periods were related to each other, and marking the dominant characteristics of each. It should be read in parts, in connection with the separate articles relating to the lives and particular works of Greek writers. The study of this literature naturally begins with the Homeric hymns and with the two great epics, the *Iliad* and the *Odyssey*. See the article Homer, XII. 108.

Greek Writers.

After this read the following articles on three great poets of ancient Greece:

Hesiod, XI. 777.
Simonides, XXII. 83.
Pindar, XIX. 98.

This brings us to the GREEK DRAMA. Read the first two paragraphs on the Attic Literature, XI. 140; then turn to the article DRAMA, VII. 403, and read the six pages devoted to Greek drama. After this take up each of the great dramatists separately, the tragedians first:

The Drama.

Æschylus, I. 208.
Sophocles, XXII. 271.
Euripides, VIII. 673.

Then re-read what is said of GREEK COMEDY, VII. 407,

and study the article on the great comic dramatist, Aristophanes, II. 507.

Historians and Orators.

PROSE WRITERS will next claim our attention, and especially the great historians, Herodotus, XI. 756; Xenophon, XXIV. 720, and Thucydides, XXIII. 322. After these make a short study of the Greek orators, XI. 142, and especially of Demosthenes, VII. 67, and of Isocrates, XIII. 388.

Philosophers.

The Greek philosophers will then come in for brief mention. Read the biographical portion of each of the following articles:

Socrates, XXII. 231.
Plato, XIX. 194.
Aristotle, II. 510.

Later Writers.

Attention may now be given to the chapter entitled, THE LITERATURE OF THE DECADENCE, in XI. 142, wherein is given a brief survey of the literary history of the Alexandrian and Græco-Roman periods of intellectual activity. Here a number of interesting names present themselves. In the department of pastoral poetry, we shall read of Theocritus, XXII. 252, and of his disciples and imitators, Bion, III. 696, and Moschus, XVI. 855. In the field of criticism we shall learn of Aristarchus, II. 504, whose studies, with those of his disciples, gradually formed the basis for the science of grammar. In mathematics we find the noted name of Euclid, VIII. 655. In prose fiction we have Lucian, XV. 42, the inventor of the art of the story-writer. In history we have Josephus, the historian of the Jewish nation, XIII. 751. In biography, Plutarch stands forth preëminent, XIX. 232. In geography appears the noted name of Strabo. In rhetoric we have Cassius Longinus, XIV. 864, the reputed author of the still famous essay on Sublimity. In philosophy are the great

names of Epictetus, VIII. 471, and Marcus Aurelius, III. 86.

But it is time to bring these readings in Greek literature to a close. It would of course be easy to extend them almost indefinitely, and the student who wishes to do so may, by referring to the numerous articles devoted to the lives of famous Greek writers, continue it to almost any desired length.

2. *Roman Literature.*—In the department of Roman literature we shall take as the basis for our studies the very comprehensive and scholarly article on that subject in XX. 715–727. This article, which gives a general survey of the progress of literature during the different periods of Roman history, should be read in sections, with constant reference to the separate articles devoted to the lives of the most famous Latin writers. In connection with the chapter on the first period (from 240 B. C. to about 80 B. C.), read the account of the ROMAN DRAMA, VII. 409, 412. Then study the history of the early Roman dramatists:

First Period.

Nævius, XVII. 161
Ennius, VIII. 447.
Plautus, XIX. 215.
Terence, XXIII. 186.

In connection with the chapter on the second period (80 B. C. to 42 B. C.), read the following special articles:

Second Period.

Cicero, V. 77.
Sallust, XXI. 219.
Catullus, V. 247.
Cæsar, IV. 633.
Lucretius, XV. 50.

With the third period (42 B. C. to 17 A. D.) we enter upon the study of the AUGUSTAN AGE OF ROMAN LITERATURE, III. 82–84. Here a noble list of names is presented, demanding a special study of the following biographical articles:

Third Period.

Virgil, XXIV. 248.
Ovid, XVIII. 78.
Horace, XII. 159.
Livy, XIV. 725.

During the fourth period, extending for more than a century (17 A. D. to 130 A. D.), Roman literature continues to flow in the old channels, but there is a manifest deterioration in almost every department of literary effort. And yet among the dramatists we have Persius XVIII. 661 and Juvenal XIII. 804; among historians, Tacitus, XXIII. 19; among philosophers, Seneca, XXI. 658; among rhetoricians, Quintilian, XX. 187; and among poets, Martial, XV. 577, and Statius, XXII. 466. "The last writer who combines genius with something of national spirit, is the poet Claudian, V. 815, who wrote his epics under the immediate inspiring influence of a great national crisis and a national hero." After him there is perhaps only one Latin writer whose life and works are deserving of study in this connection. That writer is Boetius, III. 855, who lived in the fifth century of our era, and who is described by Gibbon as "the last of the Romans whom Cato or Tully could have acknowledged for their countryman."

Fourth Period.

COURSE THE FOURTH—FOURTEEN GREAT LITERATURES.

1. *Hebrew.*—XI. 597. The Bible III. 634–641; Early Israelitish literature, XIII. 408; the Talmud, XXIII. 35; the Midrash, XVI. 285; the Mishnah, XVI. 502.

2. *Sanskrit.*—XXI. 273–286.

3. *Persian.*—XVIII. 655.

4. *Greek.*—XI. 136. Homer, XII. 108; Xenophon, XXIV. 720; Demosthenes, VII. 67.

5. *Roman.*—XX. 715–727. Cæsar, IV. 633; Cicero, V. 770; Augustan Age, III. 82; Virgil, XXIV. 248; Ovid, XVIII. 78; Livy, XIV. 725.

6. *Chinese.*—V. 653.

7. *French.*—IX. 637. Rabelais, XX. 193; Montaigne, XIV. 767; Corneille, VI. 417; Pascal, XVIII. 333; Mo-

liere, XVI. 624; La Fontaine, XIV. 203; Racine, XX. 203; Boileau, III. 863; Bossuet, IV. 70; Voltaire, XXIV. 285; Rousseau, XXI. 23; Hugo, IX. 676; Cousin, V. 521; Guizot, XI. 268; Dumas, VII. 521; George Sand, VII. 507.

8. *German.*—X. 522. Luther XV. 71; Arndt, II. 622; Wieland, XXIV. 558; Lessing, XIV. 478; Herder, XI. 727; Goethe, X. 721; Schiller, XXI. 395; Novalis, XI. 472; Hegel, XI. 612; Heine, XI. 625; Paul Heyse, X. 545; Spielhagen, X. 545; Fritz Reuter, XX. 494; Auerbach, 169 sup.; Freytag, X. 545.

9. *Italian.*—XIII. 498. Dante, VI. 809; Petrarch, XVIII. 706; Boccaccio, III. 842; Ariosto, II. 502; Alfieri, I. 502; Carducci, 404 sup.

10. *Spanish.*—XXII. 252. Lope de Vega, XXIV. 121; Cervantes, V. 347; Calderon, IV. 659.

11. *Russian.*—XXI. 102. Turgenieff, XXIII. 488; Tolstoi, 1495 sup.; Gogol, X. 738.

12. *Swedish.*—XXII. 753. Tegner, XXIII. 110; Frederika Bremer, IV. 256; Runeberg, XXI. 60; Topelius, XXII. 758; Rydberg, 1368 sup.

13. *Norwegian.*—XVII. 589. Björnstjerne Björnson, 290 sup.; Henrik Ibsen, 879 sup.; Asbjörnsen, 153 sup.

14. *Danish.*—VII. 89. Oehlenschläger, XVII. 730; Hans Christian Andersen, 102 sup.

COURSE THE FIFTH—FIFTY GREAT BOOKS.

The Bible, III. 634.
The Vedas, II. 698; Rig-Veda, XII. 780.
The Koran, XVI. 597.
Maha-Bharata, XXI. 281.
Ramayana, XXI. 280.
Shah-Nameh, XVIII, 656; IX. 225.

Zend Avesta, XXIV. 775.
Homer's Iliad, XII. 117.
Homer's Odyssey, XII. 119.
Aristotle's Ethics and Politics, I. 215; XIX. 349.
Demosthenes on the Crown, VII. 71.
Æschylus's Tragedies, I. 209.
Sophocles's Oedipus, XXII. 272.
Euripides's Medea, VIII. 675.
Aristophanes, The Knights, II. 508.
Herodotus, XI 756.
Xenophon's Anabasis, I. 787.
Cicero's Orations, XX. 514; V. 770.
Virgil's Æneid, XXIV. 253.
The Eddas, VII. 649; XXII. 201.
Nibelungen Lied, XVII. 474.
Gesta Romanorum, X. 555.
Arabian Nights, XXIII. 316.
Lucian's "True History," XV. 43.
Dante's Divina Commedia, VI. 815.
Spenser's Faerie Queene, XXII. 394.
Ariosto's Orlando Furioso, II. 503.
Shakespeare's Tragedies, VII. 430.
Bacon's Novum Organum, III. 210.
Milton's Paradise Lost, XVI. 336–339.
Bunyan's Pilgrim's Progress, IV. 529.
Gibbon's Decline and Fall, X. 578.
Mill's Logic, XVI. 312.
Darwin's Origin of Species, XXIV. 77.
Smith's Wealth of Nations, XIX. 366.
Locke On the Human Understanding, VIII. 423.
Hooker's Ecclesiastical Polity, XII. 151.
Don Quixote, V. 352.
Gil Blas, XIV. 472.
Robinson Crusoe, VII. 28.

Gulliver's Travels, XXII. 766.
Vicar of Wakefield, X. 672.
Boswell's Johnson, IV. 77.
Voltaire's Zadig, XXIV. 285.
Goethe's Faust, X. 539.
Wilhelm Meister, X. 732.
Waverley Novels, VIII. 434.
Corinne, XXII. 441.
Les Miserables, 866 sup.
Emerson's Essays, 644 sup.
Vanity Fair, Thackeray, XXIII. 215.
David Copperfield, Dickens, VII. 177.

COURSE THE SIXTH—GENERAL VIEW OF THE SUBJECT (FOR ADVANCED STUDENTS).

Prose Literature.—Let us begin our general study of prose literature by reading the article on History, XII. 19. Numerous collateral and additional references relating to the same subject will suggest themselves, and should be traced out and studied. Among these are the followlowing: Influence of history upon the development of culture, II. 121; relation of history to evolution, VIII. 759; the philosophy of history, XVIII. 796; relation of history to archæology, II. 334, etc. Following the reading of these, we may make a brief study of the distinctive features of the works of certain great historians. For example, read what is said of Herodotus, XI. 758; of Thucydides, XXIII. 325; of Livy, XIV. 726; of Sallust, XXI. 219; of Tacitus, XXIII. 20; of Villehardouin, XXIV. 229; of Robertson, XX. 599; of Hallam, XI. 393; of Macaulay, XV. 128.

Fiction.—Read the special article on Romance, XX. 632; also the article by Andrew Lang, entitled, TALES, XXIII. 27. Let this be followed by a study of the romance lit-

erature of different countries. Observe what is said of French romance, IX. 638; of German, X. 527; of Spanish, XXII. 354; of Arabian, XXIII. 5; of Persian, XVIII. 657. As to romanticism in English literature, see XX. 857. The influence of romanticism upon French literature is described in IX. 675; and upon German literature, in X. 541.

Fiction.

The Drama.—Read the very comprehensive article on the drama, VII. 391. Study about the drama in the time of Shakespeare, XXI. 759; about the Greek drama, XI. 140; about the French drama, IX. 644; about the Spanish drama, XXII. 356; about the miracle-plays, V. 324. Read the special article on the theatre, XXIII. 222.

Drama.

Poetry.—The scholarly article on Poetry, XIX. 256–273, is worthy of careful study. It would be well to read it by paragraphs, making reference in the meanwhile to additional articles on the lives and works of the great poets therein mentioned. Read Wordsworth's theory of poetry, XXIV. 670. See what is said of poetry as a fine art, IX. 207.

Poetry.

Satire.—Read the article on satire, XXI. 317. Study the lives and works of the great modern satirists: Rabelais, XX. 193; Voltaire, XXIV. 285; Dean Swift, XXII. 761; Thackeray, XXIII. 214, etc.

Satire.

Supplementary.—This course of reading may now be supplemented and brought to a close by the study of the two important articles on books, XVIII. 144, and libraries, XIV. 509.

For libraries in the United States, see page 993 sup. An interesting account of the Library of Congress is given in the article beginning on page 1557 sup.

CHAPTER VIII.

READINGS IN PHILOLOGY AND THE HISTORY OF LANGUAGE.

"They have been at a great feast of languages."—*Love's Labour's Lost.*

PHILOLOGY is that branch of knowledge which deals with human speech, and with all that speech discloses as to the nature and history of man. In the following courses of reading it is proposed to give a general survey of the principal languages of the world, their history and the distinguishing characteristics of each. These courses may be considered as either prefatory or supplementary to the courses already indicated for readings in the history of literature. A fairly good knowledge of general history, such as may be acquired from the readings designated in Chapter VI. of this volume, will add very much to your ability to appreciate and fully understand the courses which follow.

COURSE, NO. I.

Philology.

Begin with the article PHILOLOGY, XVIII. 765, and read carefully that part which relates to the science of language in general, pp. 765–778. This will give a general view of the subject, and prepare you for the more specific study of particular languages. The following articles or parts of articles may then be read:

History of language (article ANTHROPOLOGY), II. 117.

Theories of evolution with respect to language, VIII. 769.

Language and ethnology, VIII. 621.

Language and thought, XX. 751.

Language and mythology, XVII. 137.

ARYAN LANGUAGES, II. 697 and XVIII. 778 a. To this family of languages belong ten groups or sub-families, as follows:

Aryan Languages.

1. *Sanskrit.*—XXI. 269; XI. 841.
2. *Iranian.*—XVIII. 134.
3. *Armenian.*—II. 549.
4. *Greek.*—XI. 126. See also Greek literature; and learn about the Romaic dialects which originated in the Greek, XI. 135.
5. *Albanian.*—XVIII. 784.
6. *Italic.*—This group includes the Latin language, for a full history of which see XIV. 327. From the Latin have sprung the Romance languages, which are the subject of a valuable article in XX. 661. The great modern Romance languages are each treated in a separate article as follows:

(1) Italian, XIII. 491; XIV. 340.
(2) Spanish, XXII. 346.
(3) Portuguese, XIX. 555.
(4) Provençal, XIX. 867.
(5) French, IX. 629.
(6) Ladino, XIII. 492.
(7) Roumanian, XXIV. 269.

7. *Celtic.*—This group of languages is treated very briefly in XVIII. 785, and more fully in V. 297.

(1) The Gaelic language, which is a branch of the Celtic, is the subject of a separate article in X. 6. Other branches are treated as follows:

(2) Irish, V. 298.

(3) Armoric, V. 324.
(4) Cornish (dialect), V. 298.
(5) Welsh, V. 298, 314.

8. *Germanic or Teutonic.*—This great sub-family comprises two groups, known as the Eastern Germanic and Western Germanic languages. In the former group belong the Gothic language, X. 852, and the Scandinavian branch, XXI. 366. Of the Scandinavian languages there are two subdivisions: (1) the Eastern Scandinavian, which comprises,

Swedish, XXI. 370.
Danish, VII. 89, and XXI. 373,

and (2) the Western Scandinavian, which comprises,

Norwegian, XXI. 369.
Icelandic, XII. 627.

The Western Germanic languages are each treated in a separate article:

(1) English, VIII. 390.
(2) Frisian, IX. 788.
(3) German, X. 514.
(4) Dutch, XII. 84.

9. *Baltic.*—This group embraces three unimportant groups, the first of which, Prussian, is now extinct (see XVIII. 785). The other two are the Lithuanian, XXII. 148, and the Lettish, briefly referred to in VII. 188, and XVIII. 785.

10. *Slavonic.*—XXII. 147. Of this group there are two divisions, the Southern and the Western. The former includes the following languages:

(1) Russian, XXI. 109.
(2) Ruthenian, XIX. 309.
(3) Bulgarian, XXII. 149.
(4) Servian, XVIII. 544; XXII. 150.
(5) Slovenish, XXII. 150.

The latter, or Western division includes,

(1) Bohemian, XXII. 151.

(2) Polish, XVIII. 785; XXII. 150.

The GUIDE has presented above a brief outline for the study of the Aryan families of languages. The student who follows this course of reading carefully will have acquired no small knowledge of the science of philology, and he will be prepared, by way of review, to study the second part of the article on that subject, XVIII. 781–790.

COURSE, NO. II.

A second and shorter course of study in philology might include the Semitic family of languages. To this family belong:

Semitic Languages.

(1) The Hebrew language, XI. 594.
(2) The Phœnician, XXI. 641.
(3) The Assyrian, III. 192.
(4) The Syriac, II. 307.
(5) The Arabic, X. 595.
(6) The Abyssinian, XVI. 654.

By way of supplementing this course, a short time may be spent in tracing the history and peculiarities of the third great family of languages, the Hamitic (see XVIII. 778). Here we have:

(1) The Egyptian language, VII. 721.
(2) The Lybian languages, XVIII. 778.
(3) The Ethiopic languages, I. 263.

A great many other languages and dialects receive notice in the *Britannica*. Not only students of philology but many curious readers will be pleased to learn something about the language of the Gipsies, X. 613; that of the Papuans, XVIII. 231; that of the Hottentots, II. 312; or that of the Kurds, XIV. 157. But we need enumerate no further,

Miscellaneous Studies.

We have conducted the student to a point whence he will now be able to proceed in his researches without the help of a guide.

Here are a few subjects of general interest which it is well to know about:

Of General Interest.

Grammar, XI. 37.
Dictionaries, VII. 179.
Americanisms, 92 sup.
Slang, American specimens of, 1434 sup.

See now the references in the chapter on *The History of Literature* in this volume (pp. 65–78); also those in the chapter entitled *The Writer* (page 255).

CHAPTER IX.

READINGS IN ASTRONOMY.

"And let my lamp at midnight hour
Be seen in some high lonely tower,
Where I may oft outwatch the Bear
With thrice great Hermes; or unsphere
The Spirit of Plato, to unfold
What world or what vast regions hold
The immortal mind."

—*John Milton.*

THERE are two classes of persons who will be helped by the courses of scientific reading proposed in this chapter, and in those which follow: (1). The young man or young woman who is attempting to pursue some method of self-instruction at home, and is not yet prepared to grapple with the most difficult problems of science. (2). The student who is already well started on the way, and is anxious to extend and supplement the information which he has acquired from teachers and text-books, until he shall have gotten down to the very bottom of the subjects which he is studying. The first class will, as a general rule, be profited most by the shorter and more popular articles in the *Britannica;* the second will often find in the special and more technical articles just that kind of thoroughness and comprehensiveness which scholars admire and desire, and from which they alone are able to derive the greatest benefit. It is here that the superiority of the

Two Classes of Students.

Britannica over every other work of reference is most apparent—it has articles adapted to the needs and comprehension of every class of readers.

The following readings in astronomy are intended for students who have attained to some proficiency in the science; and yet an effort has been made to meet the wants of the self-taught home student as well as those of the specialist and the scholar.

The home student should read the historical portion of the article on ASTRONOMY, beginning on page 744 of volume II., and ending on page 763. He will find this chapter quite comprehensive, including nearly ten pages of the *Britannica*, and giving an account of the progress of astronomical science from the earliest ages down to the present time. The college student will find the entire article on astronomy (sixty pages in all), II. 744, to be more complete and satisfactory than most school text-books on the subject. The fact that it was written by Prof. R. A. Proctor, the most famous of our later astronomers, is sufficient guarantee of its accuracy. The supplementary article, beginning on page 161 sup., brings everything down to the present time.

History of Astronomy.

Still pursuing the study of the history of this subject, read the entertaining article on ASTROLOGY, II. 738, and see what is said of astronomy in Arabia, II. 264. After that, read the biographies of the most famous astronomers, ancient and modern: of Thales, XXIII. 217; of Aristarchus, II. 504; of Hipparchus, XI. 851; of Ptolemy, XX. 87; of Copernicus, VI. 346; of Galileo, X. 30; of Tycho Brahe, IV. 200; of the Herschels, XI. 765, 768; of John Kepler, XIV. 45; of Laplace, XIV. 301; of Richard A. Proctor, 1289 sup.

Astronomers.

You are now prepared to enter upon the study of descriptive Astronomy. Begin with the SOLAR SYSTEM, and read what Professor Proctor says of the sun in II. 768; then turn to J. Norman Lockyer's scholarly article on the same subject, XXII. 645. The nebular theory of the origin of the sun and planets will next claim your attention; and of this you will find, in XVII. 310, a full exposition and discussion by Dr. R. S. Ball, the distinguished Irish astronomer.

The Solar System.

And now, before proceeding farther, it will be interesting to notice some curious facts concerning the manner in which people of all ages and different nationalities have regarded the sun. Among other things, we shall learn how it was worshipped by the Sabæans, XXIV. 741; by the Phœnicians, XVIII. 802; by the Greeks, II. 185; and by the ancient Peruvians, I. 697. Read what is said of solar myths, XVII. 157, and XV. 777 a; also the myth of Phæthon, XVIII. 727; that of Adonis, I. 153; and that of Apollo, II. 185. Festivals to the sun were held at Heliopolis, see XIX. 91, and also in Japan, XIX. 92; and one of the most famous temples in the world was that of the sun at Baalbec, see III. 177.

Sun Worship.

Resuming the subject of descriptive astronomy, and the study of the solar system, read next of THE PLANETS in their order:

Mercury, II. 777; Venus, II. 782, XIV. 582, XVIII. 246, and II. 754 and 796; the place of the Earth in the solar system, II. 766, and X. 214; Mars, XIV. 46, and II. 776, 796; the Asteroids, II. 736, 806; Jupiter, XVI. 250 and II. 782, 808; Uranus, II. 758, XI. 767, and II. 782; Neptune, XIV. 487, and II. 782, 813. Olbers's theory of the origin of the asteroids is given in a brief biographical article on that

The Planets.

great German astronomer, XVII. 752; and the most recent facts concerning those interesting bodies are stated in the American Additions, page 159 sup.

The article on the MOON, XVI. 798, next claims attention. The moon is also described in II. 774, 782. For its motion, see XI. 74; for its phases, II. 797; for its influence on the tides, XXIII. 353–356, 365, 368: for its influence on atmospheric pressure, XVI. 124. The legends and myths of the moon are duly noticed in XI. 680 and XVII. 157.

The Moon.

Many interesting things are told about ECLIPSES. For the nature and causes of eclipses, see II. 788 and 802; turn also to XIV. 581 and XXII. 650. Some historical facts with relation to the observation of these phenomena are interesting. The Chinese have very ancient records of such observations, see II. 745. The Assyrians also kept similar records, III. 191.

Eclipses.

Read what is said about COMETS, II. 813. The article on this subject, VI. 182, belongs to mathematical astronomy. Notice Kepler's theories, XIV. 47; Leverrier's, XIV. 486; and Olbers's, XVII. 752. Recent observations on comets are described on page 162 sup., and an account of the most recent appearances of comets is given on page 1395 sup. For Biela's comet, see VI. 192, and XVI. 111. An account of the appearance of twin comets may be found in XVI. 111.

Comets.

In the article on METEORS, XVI. 106, there is much interesting information. Meteorites, or "falling stars," are noticed in XVI. 112, with the theories regarding their origin, etc. See also AEROLITE, I. 184.

Passing now beyond the solar system, read first that portion of the article on astronomy, which refers particu-

larly to the fixed stars, II. 744, 823. For the classification of these stars, with reference to magnitude, turn to XVIII. 840. An interesting notice of new and variable stars is given in XXII. 651. For the measurements of the stars, see XVI. 250; and for their spectroscopic analysis, see X. 215, and XXII. 651.

The Fixed Stars.

Among other subjects which are of interest to students of astronomy, we may mention the following:

The Zodiac, XXII. 791.

The Zodiacal Light, XXIV. 796.

The Galaxy (Milky Way), 732 sup.

Corona, VI. 428.

Celestial Photometry, XVIII. 840.

If you would acquire a knowledge of astronomical instruments, read the valuable articles on the telescope, XXIII. 135, and 1481 sup.; also that on the transit circle, XIII. 515; the notice of the micrometer, XVI. 242; of the sextant, XXI. 724; of the astrolabe, X. 181. See also the description of Pond's astronomical instruments, XIX. 452, and of Roemer's, XX. 620.

Astronomical Instruments.

Read of the famous American telescope-maker, Alvan G. Clark, 472 sup., and of the most important American observatories, 1157 sup.

In connection with the study of Astronomy, we very naturally think of almanacs and calendars. The *Britannica* gives a good deal of information concerning both of these. The article on the ALMANAC, I. 590, is especially interesting. So, too, is that on the CALENDAR, IV. 664. The different calendars that have been, or are still in use, are each fully described:

Almanacs.

The Egyptian, VII. 728.

The Hebrew, IV. 677.
The Mahometan, IV. 679.
The Burmese, IV. 555.
The Siamese, XXI. 853.
The Gregorian, IV. 671.
The famous Mexican Calendar Stone, I. 695.

The peculiar terms used in almanacs and calendars are also explained, as:

Chronological eras or epochs, IV. 681; V. 711.
Epact, IV. 672.
Dominical letter, IV. 669, etc.

The various methods of measuring time are described in XXIII. 392.

Difference between mean time and sidereal time, VI. 14.
Equation of time in astronomy, II. 772.
Timepieces, VI. 13; XXIV. 394.
Sun-dials, VII. 153.
Clocks, VI. 13, and 854 sup.
Watches XXIV. 394.
Standard time, XII. 854.

CHAPTER X.

READINGS IN ZOÖLOGY.

"I used to believe a great deal more in opportunities and less in application than I do now. Time and health are needed, but with these there are always opportunities. Rich people have a fancy for spending money very uselessly on their culture, because it seems to them more valuable when it has been costly; but the truth is, that by the blessing of good and cheap literature, intellectual light has become almost as accessible as daylight."—*Philip Gilbert Hamerton.*

THE amount and variety of information which the *Britannica* offers on all subjects connected with the natural sciences is truly wonderful. The articles on Zoölogy, or animal life, are very numerous—some of them brief, descriptive paragraphs, instructive and interesting to every reader, others exhaustive treatises designed for the study of specialists. The vast range of such subjects can perhaps best be illustrated by reference to the following schemes for courses of reading in this science. The first two are of a popular character, and are believed to be not too difficult for the home student or amateur zoölogist; the third is more purely scientific, and will be appreciated only by those who have already made considerable progress in the study, and are able to understand its technical difficulties.

Three Courses.

I. HISTORICAL COURSE.

In volume XXIV., beginning on page 799 and extending to page 803, the history of the science of zoölogy is

treated in a manner which appeals to the interest of every person who cares to acquaint himself with the progress of scientific ideas. After reading this, the student will naturally turn to the biographical sketches of the great men who have contributed most to our knowledge of this subject. The following articles will be especially interesting and instructive:

Progress of the Science.

Biographies.

Aristotle, the most famous of the ancient writers on this subject, II. 510.

Edward Wotton, the first English zoölogist (1492–1555), XXIV. 803.

William Harvey, the discoverer of the circulation of the blood (1578–1658), XI. 502.

Conrad Gesner, the eminent Swiss naturalist of the XVIth century, X. 554.

John Ray, "the father of modern zoölogy" (1628–1705), XX. 300.

Carl Linnæus, "the Adam of zoölogical science," XIV. 671.

Comte de Buffon, the first great popularizer of natural history, IV. 444.

Baron Cuvier, the eminent French naturalist, VI. 740.

Charles Darwin, the great leader of evolutionary biology, 542 sup.

Ernst Haeckel, the famous German disciple of the doctrine of evolution, XX. 422; also 808 sup.

Alfred Russell Wallace, author of "The Geographical Distribution of Animals," 1609 sup.

Albrecht von Haller, the Swiss physiologist, XI. 396.

Johannes Müller, the German anatomist, XVII. 17.

Jean Baptiste Lamarck, originator of the theory of evolution, XIV. 231.

Louis Agassiz, the great Swiss-American scientist, I. 274.

Thomas Henry Huxley, the English naturalist, XII. 874 sup.

Ernst von Baer, founder of the science of embryology, XXIV. 807.

Sir Richard Owen, the foremost of the disciples of Cuvier, 1184 sup.

John Vaughan Thompson, the great authority on marine invertebrata, XXIV. 808.

Theodore Schwann, inventor of the cell theory, XXI. 460.

John James Audubon, the greatest of ornithologists, III. 70.

Alexander Wilson, the Scottish-American ornithologist, XXIV. 590.

II. POPULAR READINGS ABOUT ANIMALS.

Mammalia.

As an introduction to these readings it will be interesting to notice the historical paragraphs in the article on ZOÖLOGY, XXIV. 799–803. Read also the first section of the article on MAMMALIA, XV. 347, and the last section of the same article, XV. 444.

Many things in the article on Anthropology, II. 107–123, are both curious and interesting, but for the present the reader's attention is directed only to the section on the Origin of Man, page 110, and that on the Races of Mankind, page 111.

The article on the APE, II. 148–169, by Professor St. George Mivart, is a complete popular and scientific description of the various families and groups of monkeys. The general reader will be interested in the first section, page 148–155, and also in the concluding sections relating to the geographical distribution, etc., of apes.

The ELEPHANT is the subject of an important article, VIII. 122. His prehistoric relatives or progenitors are

also appropriately described: the Mammoth, XV. 447; the Mastodon, XV. 622; and the Megatherium, XV. 829.

Perhaps the most interesting of all domestic animals is the CAMEL. See the general article, IV. 735, and also the section on the camel in Arabia, II. 242.

Interesting articles—historical and descriptive, and illustrated—are those on the Dog, VII. 324; and the Cat, V. 202.

Carnivorous animals are represented by the Tiger, XXIII. 385; the Lion, XIV. 679; and the Hyena, XII. 420.

Some curious animals are: the Beaver, III. 475; the Chameleon, V. 381; the Chamois, V. 384; the Sloth, XXII. 161; the Ichneumon, XII. 629.

Of the long and very comprehensive article on BIRDS, III. 699, the general reader will select the following chapters as the most interesting: Fossil birds, III. 728; migration of birds, III. 765; birds' eggs, III. 772. The different classes of birds are variously represented and described in a large number of separate articles. For the present it is unnecessary to call attention to any of these articles further than to say that no popular course of reading should omit the Ostrich, XVIII. 62; the Rhea, XX. 505; the Eagle, VII. 589; the Raven, XX. 295; the Hummingbird, XII. 357; and the Albatross, I. 449. The DODO, that wonderful bird which has but lately become extinct, is the subject of an interesting sketch, VII. 321.

Birds.

A general study of fishes, such as is contemplated in this course, should include a glance at the special article, XII. 630, and also a portion of the chapter on fish-culture, XIX. 126. The article on ANGLING, II. 32, will be read and enjoyed by every fisherman. Among the multitude of similar articles, the following on food fishes should not be omitted: Mackerel, XV. 159; Herring, XI. 764; Cod, VI.

Fishes.

103; Sardine, XXI. 307. Fossil fishes are noticed in I. 275, and poisonous fishes in XV. 782.

Reptiles. As to reptiles, read the following: Distribution of reptiles in time, XX. 465; Rattlesnake, XX. 293; Cobra, VI. 905; Asp, II. 714; Crocodile, VI. 592; Lizard, XIV. 732.

Concerning CRUSTACEA. there is a valuable article in VI. 632; but our popular course will include only the chapters relating to the Crab, VI. 538, and the Lobster, 1015 sup.

Ocean Life. Ocean life is noticed in an interesting way in the American revisions, page 1159 sup.; and the reader will not pass by the articles on the Whale, XXIV. 523; the Walrus, XXIV. 337; the Dolphin, VII. 346; and the Seal, XXI. 580.

The above lists include only a very small proportion of the articles on animals. These are sufficient, however, to indicate the great variety of interesting and practical information on zoölogical subjects contained in the pages of the *Britannica*.

This course of reading might be extended indefinitely until it should embrace many hundreds of subjects, and require half a lifetime for its completion. The purpose of the GUIDE, however, has been not to present an exhaustive course, but only to indicate that which may be completed easily by the amateur student within a comparatively brief period of time. A still briefer and much easier course is indicated in Chapter IV. of this volume.

III. SUPPLEMENTARY COURSE FOR SPECIAL STUDENTS.

The principal articles on zoölogical subjects, written by specialists and embodying all the latest discoveries, are particularly valuable to advanced students. They are remarkable alike for their comprehensiveness and their ac-

curacy. Taken together, they would form a complete library of zoölogy in themselves.

After reading the history of the science as it is related in XXIV. 799–803, together with the biographical sketches indicated in Course I. above, the student will be prepared to make some study of the various forms of classification that have been proposed by great naturalists. Most of these may be found in the special article on Zoölogy, already alluded to:

Classification.

Aristotle's, XXIV. 804.

The Linnæan, XXIV. 805.

Lamarck's, XXIV. 806.

Cuvier's, XXIV. 807.

Owen's, XXIV. 808.

Huxley's, XXIV. 809.

A valuable scientific article on classification, written by Mr. Huxley himself, may be found in II. 49. Keeping Mr. Huxley's classification in mind, the student, who cares to go so deeply into the subject, may obtain a general and complete view of the science of zoölogy by studying the following articles in the order here given:

I. *Protozoa*, XIX. 830—a valuable article, very finely illustrated.

II. *Infusoria*, XXII. 106.

III. *Coelenterata*, VI. 107—a short article, purely scientific. Under this sub-kingdom, see Hydrozoa, XII. 547, and Actinozoa, I. 129.

IV. *Annuloida*—see Echinodermata, VII. 629.

V. *Annulosa*.—Under this sub-kingdom there may be many references. We give only a few:

Crustacea, VI. 632.

Arachnida, II. 271.

Myriapoda, XVII. 115, and V. 340.

Insecta, XIII. 141 (see Index, 224).

Chaetognatha (marine worms), XXI. 148, and II. 52.
Annelida, II. 65.
VI. *Molluscoida*, IV. 188.—Under this sub-kingdom, see:
Polyzoa, XIX. 429.
Brachiopoda, IV. 188.
Tunicata, XXIII. 609; II. 53.
VII. *Mollusca*, XVI. 632; II. 54.—Under this sub-kingdom, refer to the following subjects:
Lamellibranchiata, XVI. 684.
Gastropoda, XVI. 641.
Pteropoda, XVI. 665.
Cephalopoda, VI. 735.
VIII. *Vertebrata*, XXIV. 178.—Under this sub-kingdom there might be hundreds of references given. The following articles and paragraphs will be found especially valuable:

CLASS 1. PISCES. See *Icthyology*, XII. 630; distribution of marine fishes, VII. 280, XII. 677; freshwater fishes, XII. 669; fishes of America, I. 684; geographical distribution of fishes, XII. 668; fishes of prehistoric times, XII. 666; Agassiz's researches on fossil fish, I. 275; angling, II. 32; aquariums, II. 217. Several special articles may be of interest to the general reader, such as:

Fishes.

Fish-culture, XII. 664, XIX. 126.
Angling, II. 32.
Izaak Walton, XXIV. 342.
Sea fisheries, IX. 243.
Mackerel, XV. 160.
Cod, VI. 103.
Sturgeon, XXII. 611, etc., etc.

CLASS 2. AMPHIBIA, I. 750.

CLASS 3. REPTILIA, XX. 432; snakes, XXII. 189; crocodiles, VI. 592; alligators, I. 585.

CLASS 4. AVES. See Birds, III. 699; distribution of, III. 736, VII. 269; birds of America, I. 684. Turn to the special article, ORNITHOLOGY, XVIII. 2. The history of this science, as narrated in the first pages of this article is especially interesting. The list of valuable works on birds, XVIII. 11–19, is very complete and valuable. The titles of hundreds of articles referring to different birds might be given, but we quote only a few—for example, in volume VI. are such articles as the following: cockatoo, p. 98; condor, p. 253; coot, p. 341; cormorant, p. 407; crane, p. 546; crow, p. 617; cuckoo, p. 685; curassow, p. 709; curlew, p. 711—but the student needs no guide to find such articles as these.

Birds.

CLASS 5. MAMMALIA, XV. 347—a very comprehensive and scientific article, fully illustrated.

Classification of Mammalia, XV. 370.

History of Mammalia in former times, XV. 374. See also Palæontology, X. 319.

Subclass Echidna, VII. 628.

Subclass Metatheria, XV. 378; marsupials, XIII. 838; kangaroo, III. 111.

Mammalia.

Subclass Eutheria. Order Edentata, VII. 652; sloth, XXII. 161; armadillo, II. 543; aard-vark, I. 3; anteater, XV. 385, etc.

Order Sirenia, XV. 389; the manatee, XV. 456, etc.

Order Cetacea, V. 357; whale, XXIV. 523; porpoise, XIX. 521; dolphin, VII. 346, etc.

Order Insectivora, XV. 400.

Order Chiroptera. XV. 405; bats, III. 431.

Order Rodentia, XV. 415; squirrels, XXII. 437; rabbits, XX. 192; hares, XI. 479, etc.

Order Ungulata, XV. 421; elephant, VIII. 122; rhinoceros, XX. 521; horse, XII. 172; zebra, XXIV. 772; deer, VII. 23, etc.

Order Carnivora, XV. 432; cat, V. 202; dog, VII. 324; bear, III. 461; lion, XIV. 679; tiger, XXIII. 385, etc.

Order Primates, II. 108; lemur, XIV. 440; monkey, II. 148; man, XV. 444, and II. 107, etc.

The student who has followed this course of reading to the present point will now be prepared to notice the following important special articles:

Special Articles.

Anthropology, II. 107.
Animism, II. 55.
Biology, III. 679.
Evolution, VIII. 744.
Variation and selection, XXIV. 76.
Acclimitisation, I. 84.
Reproduction, XX. 407.
Embryology, VIII. 163.
Breeds and Breeding, IV. 244.
Hybridism, XII. 422.
Distribution of Animals, VII. 267.
Longevity of Animals, XIV. 857.
Animal Physiology, XIX. 10.
Instinct, XIII. 157.
Histology, XII. 4.

CHAPTER XI.

READINGS IN BOTANY.

"In my garden I spend my days; in my library I spend my nights. My interests are divided between my geraniums and my books."—*Alexander Smith.*

THE reader who wishes to acquire a general knowledge of the subject of botany, may begin by reading the chapter on the history of Botanical Science, IV. 79. After this, read the biographies of the famous men who have contributed most to the advancement of this science. Among these the following are named as among the most important:

Great Botanists.

The elder Pliny, the first who made any extensive catalogue of plants, XIX. 224.

Andreas Cæsalpinus, the great Florentine botanist of the 16th century, IV. 633.

John Ray, the originator of the "natural system" of classification, XX. 300.

Tournefort, the foremost French botanist of the 17th century, XXII. 490.

Carl Linnæus, the real founder of the science, XIV. 671.

Jussieu, a famous French family of botanists, XIII. 788.

Robert Brown, the first British botanist to adopt and support the "natural system," IV. 385.

Asa Gray, the well-known American botanist.

After having read these biographical sketches, turn again to the special article on BOTANY, IV. 79–163, and notice the comprehensive manner in which the subject is there treated. This article comprises much more matter than is contained in the ordinary school text-books, and, as you will see, is profusely and beautifully illustrated, with numerous full-page plates.

If it is your wish to make a thorough study of the anatomical structure of plants, their arrangement and classification, their distribution over the globe, and the uses to which they are subservient, you will find this article to be full of just the kind of information that you want. We will suppose, however, that you prefer, instead of studying every portion of this article, to use it for purposes of reference and in order to supplement the information which you obtain from other sources. If this be the case, consult the "Index of Principal Subjects," IV. 162. Even if you are making only a hasty and superficial survey of this delightful science, you will find several chapters in this article worthy of your attention. Here are a few which you cannot afford to pass unnoticed:

Article on Botany.

Different parts of flowers, p. 126; essential organs of flowers, p. 134; respiration of plants, p. 119; pollen, p. 138; fertilization, p. 147; mosses, p. 107; lichens, p. 107; leaves, pp. 108–119; fruit, pp. 148–153.

Other articles relating to botanical topics are numerous. See the following:

Distribution of plants, VII. 286.
Propagation of plants, XII. 211, 234.
Reproduction of plants, XX. 423.
Fertilization by insects, XIII. 142.
Linnæus's classification of plants, XIV. 672.
Morphology, XVI. 841.

Physiology of plants, XIX. 43.
Insectivorous plants, XIII. 134.
Parasitic plants, XVIII. 264.

The article on the VEGETABLE KINGDOM, XXIV. 125–131, contains a complete classification of plants. Read also:

Algæ, I. 507.
Fungus, IX. 827.
Lichens, XIV. 552.
Hepaticæ, XIV. 718.
Muscineæ, XVII. 65.

The Herbarium.

In pursuing the study of botany in a practical way, it is of course necessary that you should acquire a knowledge of plants at first hand, through personal observation. You must, therefore, make a collection of plants and arrange an herbarium for your own use and study. Full directions for doing this may be found in XI. 717.

Further Studies.

And now, for further references to plants, their culture, uses, etc., see the chapters in this volume entitled, *The Gardener*, *The Fruit Grower*, and *The Woodsman*. In the first will be found a series of readings on the propagation and care of flowers and vegetables, and in the others some interesting and curious matter pertaining to trees, their modes of growth, their history, and their uses in the world's economy. It is well to remember that all the most important trees and plants in existence are the subjects of special articles in the *Britannica*. These may readily be found by consulting the Index volume.

CHAPTER XII.

READINGS IN GEOGRAPHY.

THIS subject is as illimitable as the globe itself. To the teacher of geography, the *Encyclopædia Britannica* offers an amount and variety of matter pertaining to this subject which cannot be found in any similar work. A mere enumeration of all the articles relating to geography would fill many pages of this volume, while the study of them would occupy much more time than is ever allotted to the subject at school. The GUIDE proposes to do no more, therefore, than to point out some of the most important articles, and at the same time indicate a few brief courses of reading in connection with certain interesting geographical topics.

I. HISTORY OF GEOGRAPHY.

Early Geographers.

The chapter on the progress of geographical discovery, X. 175–196, is replete with entertaining information for both teacher and student. The copy of the famous Borgia map of the world as known at the beginning of the 15th century, is extremely interesting, and will bear much study. In this chapter we encounter the names of some of the early geographers: for example, of Eratosthenes, who first reduced the science to a system, VIII. 519; of Hipparchus, who proposed a method for determining the relative positions of places upon the earth, XV. 516; of Ptolemy,

whose maps are the most ancient that have come down to modern times, XX. 87; of Strabo, famous as a scientific geographer, XXII. 580. Here, too, we learn about the discovery of the mariner's compass, VI. 225; of the services of Prince Henry the Navigator, XI. 672; of the invention of the astrolabe, XVII. 251; of the great promoters of geographical knowledge, Hakluyt, XI. 378, and Purchas, XX. 114; of the voyages of Columbus and his successors; and of all the late discoveries in the Arctic Regions and in Africa.

II. A VIEW OF THE WORLD.

The World as a Whole.

Every reader of the *Britannica* will of course understand that all articles descriptive of the continents, and indeed of every place of importance in the world are to be found in their appropriate places in the different volumes of this work. Hence, it is not necessary to encumber the pages of the GUIDE with mere lists of such articles. The titles of some of these articles may be grouped together, however, according to topics, in such a way as to indicate a number of brief courses of reading on geographical subjects. Begin, for example, with the world as a whole. Read the article on Physical Geography, X. 210. Then take up the following in their order:

The Globe, X. 680–685.
Maps, XV. 515–523.
The Ocean, X. 211, 221, 282.
Atlantic Ocean, III. 15.
Pacific Ocean, XVIII. 114.
Indian Ocean, XII. 820.
Ocean Currents, III. 16, X. 283.
Currents of the Pacific Ocean, XVIII. 117.
Currents of the Indian Ocean, XII. 821.

The Continents: Europe, VIII. 680; Asia, II. 683; Africa, I. 245, and 42 sup.; Australia, III. 103;
Land. America, I. 669.

Seas, XXI. 578 (see Index volume, page 396); Mediterranean Sea, XV. 819; Red Sea, XX. 316; Aral Sea, II. 306; Black Sea, III. 795; Caspian, V. 176; Baltic, III. 293; North, XVII. 563; Caribbean, V.
Water. 103, etc.

Lakes (special article) XIV. 216.

Rivers, XX. 571; The Amazon, I. 654, 674; Mississippi, XVI. 518, and 914 sup.; Nile, XVII. 504, VII. 705; Niger, XVII. 496; Congo, XXIV. 763; Indus, XII. 847; Euphrates, VIII. 668; Ganges, X. 68; Rhine, XX. 518; Danube, VI. 819.

Mountains, XVII. 4; Alps, I. 619; Atlas, III. 27; Apennines, II. 169; Appalachian, II. 200; Andes, II. 15; Rocky, XXIII. 796; Himalaya, XI. 821; Ural, XXIV. 3; Pyrenees, XX. 124.

III. MISCELLANEOUS GEOGRAPHICAL SUBJECTS.

Some interesting and curious selections worth reading in connection with the study of geography:

Interesting Topics. The Sahara Desert, XXI. 149.

Death Valley (Amargosa desert) region in California, 552 sup., and 782 sup.

Dead Sea, VII. 1;

Sargasso Sea, III. 20, 26.

Mount Vesuvius, XXIV. 195.

Volcanoes, X. 240.

Earthquakes, VII. 608.

Mammoth Cave, XV. 448.

Niagara Falls, XVII. 472; Yosemite Falls, 386 sup.

The Black Forest, XXIV. 669.

Gibraltar, English fortress in Spain, X. 583.

Polar Regions, XIX. 315, 330; Arctic Explorations, 133 sup. These two articles give a complete history of arctic exploration and adventure from the earliest times to the present.

Recent explorations in Africa, 42 sup.

Famous Cities.

Famous Cities and Towns: Aix-la-Chapelle, I. 431; Alexandria, I. 493–496; Athens, III. 1; Baden-Baden, III. 226; Baghdad, III. 231; Benares, III. 555; Berlin, III. 593; Boston, IV. 72; Bristol, IV. 348; Brooklyn, IV. 370; Brussels, IV. 404; Cabul, IV. 623; Cairo, IV. 645; Calcutta, IV. 556; Cambridge, IV. 728; Chicago, V. 610; Edinburgh, VII. 658; Havana, XI. 524; London, XIV. 818 (see Index volume, page 265); Madrid, XV. 189; New Orleans, XVII. 402; New York, XVII. 457 (see Index volume, page 312); Paris, XVIII. 274 (see Index volume, page 332); Rome, XX. 833 (see Index volume, page 377); St. Petersburg, XX. 190; Venice, XXIV. 141 (see Index volume, page 456); Vienna, XXIV. 219; Versailles, XXIV. 176. Jerusalem, XIII. 636; Ispahan, XIII. 393; Palmyra, XVIII. 198; Antioch, II. 130; Tyre, XXIII. 710; Constantinople, VI. 302; Mecca, XV. 669; Medina, XV. 817.

IV. THE UNITED STATES.

Our Country.

See the special article, XXIII. 729–829, and the index on the last page. See also the historical and statistical view of the United States, 1523 sup. Both of these long articles are interesting and comprehensive, presenting a complete exposition of the geographical features of the country, together with an account of its history, industries, and natural resources.

Each of the States and Territories is treated in a similar manner, both in the body of the *Britannica* and also

in the supplement, or American Revisions and Additions. For example, for Arizona, see II. 538 and 139 sup.; Arkansas, II. 539 and 139 sup. All these may be easily found without any further help from the GUIDE.

V. CLIMATE, ETC.

Read AIR, I. 427; ATMOSPHERE, III. 28.
Read the article on Climate, VI. 1.
Principal causes which determine climate, VI. 2.
Effect of vegetation on, VI. 4.
Hygienic value of oceanic climate, V. 1, 5.
Influence of Gulf Stream upon climate, III. 21.

The Weather.

The weather, XVI. 157.
American system of weather signals, XXIV. 1617.
Winds, XVI. 143.
Relation of winds to climate, VI. 6.
The anemometer, for measuring the winds, II. 24.
The simoom, II. 239.
Monsoons, II. 690.
Trade winds, XVI. 143; influence upon climate, I. 675.
Cyclones, III. 33.
Tornadoes, XXIII. 807.
Hurricanes, XVI. 154.
Rainfall, XVI. 128; its influence on climate, VI. 6; rain-gauge, XX. 256.

CHAPTER XIII.

READINGS IN MATHEMATICS.

"Inquire about everything that you do not know; since, for the small trouble of asking, you will be guided in the road of knowledge."

—*From the Persian.*

IN the *Britannica*, each of the great branches of mathematical science is treated under its own head and at considerable length, and yet it is not presumed that any person will attempt to acquire the mastery of arithmetic, or algebra, or geometry from these articles. Here, if anywhere, the guidance of the living teacher and the assistance of specially prepared text-books are absolutely essential. The mathematical treatises in the *Britannica*, therefore, are valuable chiefly for occasional reference—they are not intended for general study, and certainly not for popular reading. Students and teachers, however, will frequently be able to derive valuable assistance from them in the solving of knotty problems or in the elucidation of difficult propositions. It is well, therefore, to remember where they can be found.

For Reference Only.

HISTORY OF MATHEMATICS.

The history of mathematics is a subject in which every student, whether he be a mathematician or not, must feel no little interest; and it is to a knowledge of this subject rather than to the abstruse study of any particular branch

of the science, that the present course of reading points.

Ancient Mathematics.

It is supposed that the reader has already some general acquaintance with the elementary principles of mathematics, derived, as is ordinarily the case, from the text-books used at school. These readings from the *Britannica* will supplement his present knowledge, and perhaps encourage him to advance still farther in his acquisitions.

The best introduction to this course is the short article on MATHEMATICS, XV. 629. Read especially the historical parts, and omit, until a future time, such sections and paragraphs as seem too technical or too difficult for ready comprehension.

Notice what is said of Pythagorean mathematics, XX. 140, and of Hindu mathematics, XXI. 294.

Now read the historical portion of the article on ARITHMETIC, II. 524–526. The paragraphs relating to the different methods of notation are especially interesting. The biographies of the following distinguished arithmeticians should be read next:

Great Mathematicians.

Archimedes, the greatest mathematician of ancient times, II. 380.

Apollonius of Perga, who flourished a little later than Archimedes, II. 187.

Diophantus, a Greek writer on arithmetic, 4th century, I. 511.

Maximus Planudes (died 1350), referred to in XVII. 627.

Robert Recorde (1558), author of an algebra entitled *The Whetstone of Witte*, and of one of the first arithmetics published in English, XX. 310.

Next, turn to the history of algebra, I. 511–518. Notice the list of writers on algebra, page 518. Read the following biographies of distinguished algebraists.

Girolamo Cardan (16th century), author of the second printed book on algebra, V. 90.

Algebra.

Rene Descartes, VII. 115.

Joseph Louis Lagrange, XIV. 207.

Leonard Euler, demonstrator of the binomial theorem, VIII. 665.

Fourier, author of Fourier's theorem, IX. 490.

Sturm, author of Sturm's theorem, XXII. 612.

Leonard of Pisa, XIX. 125.

The history of geometry is very briefly told in X. 376.

Geometry.

Concerning great geometricians, it will be well of course to refer first to Euclid, the greatest of them all. Read his biography, VIII. 655. Then notice the following:

Thales, XXIII. 218.

Theodosius, XXIII. 260.

Pythagorean contributions to the science of geometry, XX. 139.

Apollonius of Perga, II. 188.

Boetius on geometry, III. 857.

Legendre's work on geometry, XIV. 414.

Trigonometry.

For the history of Greek trigonometry, see XX. 87, under the article on Ptolemy; a brief notice of Indian and Arabian trigonometry is given in XXIII. 561, and an account of modern trigonometry in XXIII. 562. Of biographies, read the following:

Hipparchus, Greek mathematician, XI. 851.

John Napier, inventor of logarithms, XVII. 177.

Edmund Gunter, inventor of the terms cosine, cotangent, etc., XI. 330.

Sir Isaac Newton, XVII. 438.

Gottfried Leibnitz, XIV. 417.

Besides the mathematicians already mentioned, there

are several others whose biographies are given in the *Britannica*. In order to acquire a complete knowledge of the history of the science, you should learn something about these men. Here is a partial list which, if you wish, you will be able to extend as you progress with the reading:

Men of Figures.

Pappus of Alexandria, XVIII. 229.
Alhazen (11th century), I. 572.
Henry Briggs (16th century), IV. 343.
Thomas Allen (16th century), I. 583.
Simon Stevinus (17th century), XXII. 531.
Alexander Anderson (17th century), II. 14.
Gaspard Monge (18th century), XVI. 738.
Thomas Simpson, XXII. 866.
Robert Simson, XXII. 876.
Jakob Steiner (19th century), XXII. 531.
George Peacock, XVIII. 443.
Christiaan Huygens (17th century), XII. 415.

For a popular course of reading in the history of mathematics, perhaps the foregoing is sufficient. Besides the four branches of the science already mentioned, there are others upon which the *Britannica* contains valuable and scholarly articles intended particularly for specialists in mathematics. Several additional articles also on mathematical subjects may be found under their own headings or by reference to the Index. The GUIDE ventures to name here the following, not that they should be included in any course of reading, but simply to remind the student of their presence in the *Britannica* and to indicate where he may find them if occasion should require that he should refer to them.

Mathematical Topics.

Abacus (arithmetical device), I. 4.
Calculating machines, IV. 654.

Squaring the circle, XXII. 433.
Annuities, II. 72.
Astronomy, XXIV. 85.
The Almagest, I. 589.
Angles, II. 29.
Curve, VI. 716.
Calculus, XIII. 5.
Functions, IX. 818; XIV. 209; XIV. 413.
Geodesy, X. 163.
Gauging, XVI. 28.
Logarithms, XIV. 772.
Measurement, XV. 659.
Mechanics, XV. 676.
Quaternions, XX. 160.
Surveying, XXII. 695.
Variations, XXIV. 85.
Probability, XIX. 768.
Projections, XIX. 793.
Surface, Congruence, Complex, XXII. 668.

CHAPTER XIV.

READINGS IN THE STUDY OF MAN.

"The proper study of mankind is man."—*Pope.*

Divisions of the Subject.

A COMPLETE study of Man in all his various relations to the animal and spiritual world would embrace an investigation of many branches of knowledge, each occupying a distinct field of its own, but each dependent to a greater or less extent upon its kindred sciences. Among these branches the following are the most important.

1. Anatomy, which treats of the structure of the human body (see I. 799).

2. Physiology, which treats of the functions and relations of the different parts of the body, XIX. 8.

3. Psychology, which investigates the operations of the human mind (see the references in this volume, page 120).

4. Philology, which deals with the general principles of of language (see Chapter VIII. in this volume).

5. Ethics, which treats of man's duty to his fellow-men (see the references in this volume, pages 117–119).

6. Sociology, which treats of the origin and development of human institutions, VIII. 619; XVIII. 796; XIX. 347.

7. Religion, which deals with man's relations to the spiritual world, and his duties to God (see the chapter entitled *The Theologian*).

8. Anthropology, the natural history of man.

9. Ethnology or Ethnography—properly a subdivision

of Anthropology—which deals with the subdivisions of the human race, such as hordes, clans, tribes, nations, etc.

10. Archæology and Antiquities, which treat of the early history of man, and of the remains of ancient art.

11. History (see chapter VI. in this volume).

It is proposed to indicate in the present chapter a few courses of reading from the *Britannica* which shall cover only the subjects numbered 8, 9, and 10, above.

I. ANTHROPOLOGY.

Let us take as the basis of our studies the comprehensive and scholarly article by Professor E. B. Tylor in volume II. pages 107–123. As to man's place in nature, refer to the article Animal Kingdom, II. 49. Certain portions also of the following articles may be read: Physiology, XIX. 8; Histology, XII. 4. See, also, XV. 444, and the articles on

Origin of Man.

Evolution, VIII. 744.

Charles Darwin, 542 sup.

Ape, II. 148.

Man and Monkeys, II. 107.

Concerning the origin of man, see the following: I. 136; X. 291; II. 333, 341; also the myths of his creation, III. 141; XVII. 157. Read the section on this subject in II. 110.

The chapter on the races of mankind II. 111–115, may be supplemented by the references under Ethnology, below.

Concerning the antiquity of man, read the sections in X. 368 and II. 115; then see the references under Archæology, below.

Language.

Read the section on language, II. 117–120; also the following:

Evolutionary theories of language, VIII. 769.

Relation of language to thought, XX. 75.

Relation of language to mythology, XVII. 137.
(See Chapter VIII. in this volume).

Culture. Study next the development of civilization and culture. Read section vi. volume II. pages 120–123; and also what is said of the earliest seats of civilization, II. 342, and of Buckle's theory of civilization, IV. 421.

II. ETHNOLOGY.

Read by sections the article entitled Ethnography, VIII. 613–626. (Note the distinction between Ethnography and Ethnology, p. 613.) The following are a few of the articles or sections which will be found interesting in connection with this study.

Races.

The Family, IX. 17.
Tribes among Primitive Races, IX. 20.
Races of Mankind, II. 111.
Ages of Man, II. 122, also II. 336–341.
Food, VIII. 616.
Fire, IX. 227–232.
Religious Development (see Chapter entitled *The Theologian*, in this volume).
Myths and Legends, VIII. 623; VIII. 837; XVII. 135; XXIII. 28; IX. 358.
Magic, XV. 199.
Superstitions, VIII. 623 (see also the references named on pages 138–139 of this volume).

Characteristics. For the characteristics which distinguish man in different countries, see under the head of each country. For example, for Man in Africa, see the article Africa, I. 260; so also we shall find,

Man in Alaska, 70 sup.
Man in Algeria, I. 564.
Man in America, I. 686.

Man in Arabia, II. 245.
Man in Asia, II. 697.
Man in Australia, III. 118,
and so on, for every country of importance in the world.

Some curious races are also described in an entertaining way:

The Natives of the Andaman Islands, II. 11.
The Hottentots, XII. 309.
The Bushmen, IV. 575.
The Bongo, IV. 32.
The Ainos of Japan, I. 426.
The Dyaks, IV. 58.
The Czechs, VI. 754.
The Copts, VI. 354.
The Cossacks, VI. 448.
The Natives of Anam (ugliest in the world), VI. 95.
The Esquimaux, VIII. 543.
The Natives of Polynesia, XIX. 422.

Customs. Concerning the origin of justice and morals, and their development among primitive peoples, see VIII. 624. Also marriage, XV. 565; IX. 18; totemistic marriage ceremonies, XXIII. 470; marriage among ancient Mexicans, XVI. 213; myths relating to marriage, XVII. 158.

Cannibalism, IV. 807.
Totemism, XXIII. 467.

III. ARCHÆOLOGY AND ANTIQUITIES.

Antiquities. Under this head we shall include a brief survey of a few of the more interesting antiquities described in various articles in the *Britannica*. No attempt will be made at classification. Read first the brief article on Antiquities, II. 134, and then turn to Archæology, II. 333. This latter article may be

studied by sections in connection with the supplementary article on the same subject, 130 sup.

Then read, as occasion requires, or as inclination may direct, the following articles, which have been selected on account of their interest to general readers:

Antiquity of Man, II. 115.
Antiquities of America, I. 692.
The Mound Builders, III. 390, and 131 sup.
Ancient American Architecture, II. 450.
Ancient Ruins in Yucatan, XXIV. 758.
Antiquities of Egypt, VII. 767–784.
Antiquities of Peru, I. 696.
Wall of Romulus, XX. 812.
Wall of Servius, XX. 813.
Wall of Antoninus, II. 139.
Wall of Hadrian, XI. 723.
Great Wall of China, V. 638, 644.
Baalbec, III. 176.
The Temple of Bel, III. 183.
Wall-sculptures of Babylon, XVII. 34.
Nineveh, XVII. 511; II. 397.
Schliemann's Researches in Ancient Troy, II. 341.
Olympia, Recent Discoveries at, XVII. 765.
Mycenæ, Ancient Remains of, XVII. 115.
Tiryns, XXIII. 407.
Temple of Poseidon, XVIII. 133.
The Palladium, XVIII. 188.
Painted Tombs of Corneto, VI. 423.
Mummies, XVII. 20.
Pompeii, XIX. 444.
Herculaneum, XI. 723.
Cave Animals and Cave Man, V. 266.
Prehistoric Stone Circles, II. 383.
Stone Monuments, Dolmens, etc., XXI. 50.

Stonehenge, XXII. 576.
Ancient Monuments in Peru, II, 451.
Stone Monuments in Polynesia,XIX. 428.
Sepulchral Mounds in Various Countries, 1413 sup.
Animal Mounds of Wisconsin, XXIV. 618.
Druidic Monuments, XXI. 52.
Ancient Barrows, III. 397.
Old Roman Roads, XX. 582.
The Catacombs, V. 206–216.
Ancient Stone Weapons, II. 553.
Ancient Inscriptions, XIII. 114–133.
Ancient Bottles, IV. 167.
Ancient Bracelets, IV. 187.
Ancient Bricks, IV. 279.
Ancient Brooches, IV. 369.
Ancient Lamps, XIV. 247.
Ancient Mirrors, XVI. 501.
Ancient Baths, III. 434.
Ancient Mosaics, XVI. 850.
Ancient Relics, XX. 355.
Relics in connection with Christian thought and practice, XX. 357.
Ancient Rings; earliest existing rings, cylinders, Roman rings, XX. 560; Episcopal rings, poison rings, XX. 561.
Ancient Plate (Assyrian, Etruscan, etc.), XIX. 179–182.
Ancient Writing Materials, XVIII. 143, 232.
Ancient Pottery, III. 189.
Antiquarian Societies, II. 135.
Archæological Societies.
Ancient Textiles, Weaving in Prehistoric Times, etc., XXIII. 206.

CHAPTER XV.

READINGS IN PHILOSOPHY.

Definition.

PHILOSOPHY is a term the meaning and scope of which have varied greatly according to the usage of different authors and different ages. The aim of the courses of reading which we shall here attempt to indicate, is to afford a general view of the history of philosophic ideas from the earliest times to the present, with a brief notice of some of the famous schools of philosophy, and of their influence upon modern thought. Of the large number of articles in the *Britannica*, which may be utilized for this purpose, only those will be named which are the most essential to a general knowledge of the subject or which are deemed to be of the greatest interest to the young student or the casual reader.

I. ETHICS.

Ethics.

The special article on Philosophy, XVIII. 791, may be made the starting-point and basis for these studies. This article, leaving controversial details as far as possible in the background, attempts to explain generally the essential nature of philosophy, and to indicate the main divisions into which, as a matter of historical fact, its treatment has fallen. After reading the first and second divisions of this article, pp. 791–793, let us make a brief study of the lives of some of the famous ancient philosophers, and of the different schools which they founded.

But first, turn to the article on ETHICS, VIII. 574, and read the introductory paragraphs defining and giving a general account of this division of the subject. Read next the article on Thales, the first philosopher of Greece, and the founder of Greek astronomy and geometry, XXIII. 217. Then read the following articles in their order:

Pythagoras (580–500 B. C.) and Pythagoreanism, XX. 137.

Heraclitus of Ephesus (530–470 B. C.), XI. 681.

Democritus (470–362 B. C.), VII. 59.

The Sophists, XXII. 263; The Age of the Sophists, VIII. 576.

Ancient Philosophers.

Socrates (470–399 B. C.), XXII. 231; Socratic Schools, VIII. 578.

Aristippus, II. 506; The Cyrenaic School, VI. 750.

The Cynics, VI. 745, VIII. 578; Antisthenes, II. 136; Diogenes, VII. 245.

Plato, XIX. 194, VIII. 579; Platonism, I. 68; Plato and Aristotle, VIII. 580; Plato's school, VIII. 587; The Academy, I. 68.

Aristotle, II. 510; Aristotle's Ethics, VIII. 581; his logic, XIV. 784; his metaphysics, XVI. 79; The Peripatetics, XVIII. 545.

Stoicism, VIII. 583; XXII. 561.

Epicurus, VIII. 472, 586.

Marcus Aurelius, III. 86.

Neoplatonism, XVII. 332; VIII. 587.

Mysticism, XVII. 128.

Christian ethics, VIII. 588; faith, VIII. 589; love and purity, VIII. 590.

Alexandrian school, I. 498.

St. Augustine, Christian philosopher, III. 75.

St. Ambrose, I. 662.

Scholastic philosophy, XXI. 117.
Thomas Aquinas, II. 231.
Albertus Magnus, I. 453.
Abelard, I. 34.
Bernard of Clairvaux, III. 601.
Grotius, XI. 217.

Modern Philosophers.
Hobbes and his "Leviathan," XII. 31.
The Cambridge Moralists, VIII. 597.
Henry More, XVI. 814.
John Locke, XIV. 751.

Shaftesbury, XXI. 731.
Bernard de Mandeville, XV. 472.
David Hume, XII. 346.
Adam Smith, XXII. 169.
The Intuitional School, VIII. 603.
Dugald Stewart, XXII. 546.
Utilitarianism, VIII. 606.
William Paley, XVIII. 181.
Jeremy Bentham, III. 575.
John Stuart Mill, XVI. 307.
Auguste Comte, VI. 229.
Immanuel Kant, XIII. 844.
Georg Friedrich Hegel, XI. 612.
Ralph Waldo Emerson, I. 729.

Finally, this study of ethics may be brought to a close by reading the concluding paragraph on that subject in XVIII. 796.

II. METAPHYSIC.

Definition.

Metaphysic is "the science which deals with the principles which are presupposed in all being and knowing, though they are brought to light only by philosophy." According to Aristotle it includes also theology, the science of God. It is treated at

considerable length by Professor Caird of Glasgow, in XVI. 79–114.

References.

See the references given above for Aristotle, the Sophists, the Socratic school, Neoplatonism, Kant, Locke, etc. Read also the following articles:

Bacon, III. 200; XXIII. 244.
Descartes, VII. 115.
Fichte, IX. 134; XX. 290.
Spinoza, XXII. 399.
Animism, II. 55.
Realism, XXI. 419.
Idealism, 882 sup.
Analytic Judgments, I. 797.
Association of Ideas, II. 730.
Antinomy, II. 130.

III. PSYCHOLOGY.

Psychology, "the science of the phenomena of the mind," is the subject of a long and very learned article by Professor Ward, of Cambridge University, XX. 37–85. It may be read by sections with collateral references to the articles treating of the lives and works of the men who have done most for the development of this science.

Modern Psychology.

See the references given above for Locke, Hume, Mill, and many others.

Read also the following articles:

Berkeley, III. 589.
Bain, I. 223; III. 534.
Herbart, XI. 718.
Leibnitz, XIV. 417.
Herbert Spencer, II. 733.
Sir William Hamilton, XI. 416.

Association of ideas, II. 730.
Analytic judgments, I. 797.
Belief, III. 532.
Imagination, XX. 57.
Feeling, XX. 40, 66, 74.
Abstraction, I. 58.
Absolute, I. 57.
Analysis and Synthesis, I. 796.
Attention, III. 52, etc., etc.

Psychology in relation to ethics, VIII. 574; in relation to logic, XIV. 780; to metaphysics, XVIII. 848; to evolution, VIII. 766; to religion, XXIII. 274.

Aristotle's Psychology, II. 522; Plato's, XIX. 201; the Stoics', XXII. 565; Xenocrates's, XXIV. 719; Hume's, XII. 352; Cousin's, VI. 525; Descartes', VII. 126; Hegel's, XI. 620; Leibnitz's, XIV. 422; Kant's, XIII. 848; Lewes's, XIV. 491. See additional references to this subject in the chapter entitled *The Teacher*, page 251, of this volume.

IV. LOGIC.

Logic is the systematic study of thought. The subject is discussed in a comprehensive and scholarly article by Professor Adamson, of Manchester, in Volume XIV. of the *Britannica*, pages 780–803. Hamilton's contributions to the development of this science are briefly noticed in XI. 419; John Stuart Mill's in XVI. 312; Whately's in XXIV. 530; Hutcheson's in XII. 411; Condillac's in VI. 251; Gilbert de la Porrée's in X. 592; De Morgan's in VII. 66; Hegel's in XI. 619; Kant's in XIII. 852; Leibnitz's in XIV. 422; Lully's in XV. 64.

Logicians.

The various terms and distinctive expressions used in

the science are defined separately in the *Britannica*, each under its own head. For example:

Terms.

A priora and a posteriora, II. 214, etc.
Reductio ad absurdum, I. 59.
Accident, I. 83
Analogy, I. 791.

Analysis, I. 793, 796, etc.

See the references given above for Aristotle, Kant, Mill, Hegel, etc.

Read also the following articles or paragraphs:

Lotze, XV. 12.
Ueberweg, XXIII. 716.
Condillac, VI. 249.
Ulrici, XXIII. 721.
Analytics, XIV. 785.
Dialectics, XIV. 786; II. 516.
Deduction, I. 797.
Induction, I. 797; XIV. 785.
Syllogism, XIV. 789.

V. AESTHETICS.

By Aesthetics is generally meant the science of the beautiful, with its allied conceptions and emotions. A brief survey of the subject and the various problems which its study involves is given in a special article by Professor James Sully in I. 212–224. After reading the first two sections of this article, see the references given above for Socrates, Plato, Aristotle, and the other philosophers mentioned under the head of Ethics. Read next the chapter on the history of aesthetic systems, pp. 214–224.

The Beautiful

This course of reading may be brought to a close with a study of the short section on aesthetics, XVIII. 795.

CHAPTER XVI.

READINGS FOR BIBLE STUDENTS.

"This course of reading Scripture and good books will be many ways to your great advantage."—*Richard Baxter*, 1660.

SUNDAY-SCHOOL teachers, ministers of the gospel, theologians and all students of the Bible will find the *Encyclopædia Britannica* replete with information concerning all subjects connected with Bible history, biography, or geography. There is scarcely a proper name in the Old Testament or the New that is not the subject of a special article. The history of the Bible itself, with that of the critical problems connected with the books which compose it, is ably and fully discussed by Prosessor W. Robertson Smith in a fourteen-page article, III. 634–648. Many of the books composing the Bible, are treated separately in a similar comprehensive manner. See the following:

Bible History.

Books of the Bible.

Pentateuch and Joshua, XVIII. 505–514. This article embraces a complete survey of the first six books of the Bible, with a careful discussion of the Mosaic law, and a notice of the most recent criticisms and opinions.

The Book of Ruth, XXI. 110.

The Books of Samuel, XXI. 252.

The First and Second Books of Kings, XIV. 83.

Chronicles, V. 706.

The Books of Ezra and Nehemiah, VIII. 831.
The Book of Esther, VIII. 560.
The Book of Job, XIII. 697, 420.
The Book of Psalms, XX. 29, and XII. 589.
The Book of Proverbs, XIX. 879.
The Book of Ecclesiastes, VII. 623.
Song of Solomon, V. 32.
Prophet, Prophets, XIX. 814.
Lamentations of Jeremiah, XIV. 240.
The Book of Daniel, VI. 803.
The Old Testament Canon, V. 1.
The Gospels, X. 789.
Acts of the Apostles, I. 123.
Epistles of St. Paul, III. 642.
Epistle to the Hebrews, XI. 602.
Epistle to the Romans, XX. 727.
Epistles to the Corinthians, VI. 399.
Epistle to the Galatians, X. 19.
Epistle to the Ephesians, VIII. 458.
Epistle to the Colossians, VI. 164.
Epistles to the Thessalonians, XXIII. 297.
Epistles to Timothy and Titus, XVIII. 348.
Epistle to Philemon, XVIII. 741.
Epistle of St. James, XIII. 553.
Epistles of St. Peter, XVIII. 697.
Epistles of St. John, XIII. 707.
Epistle of St. Jude, XIII. 761.
The Book of Revelations, XX. 496.
The New Testament Canon, V. 7.
Apocalyptic Literature, II. 174.
The Apocrypha of the Old Testament, II. 180; the book of Baruch, III. 404; Esdras, VIII. 541; Judith, XIII. 765; Maccabees, XV. 131; Tobit, XXIII. 428.
Israel, XIII. 396.

Moses, XVI. 860.

Miscellaneous Bible Topics.

David, VI. 836.
Jews, XIII. 679.
Bible Concordance, VI. 240.
Bible Glosses, X. 687.

Versions of the Bible:

Versions.

English, VIII. 381; Wycliffe's, XXIV. 710; Tyndale's, XXIII. 675; Coverdale's, VI. 531; Luther's, XV. 76; Geneva, VIII. 387; the Septuagint, XXI. 667.

Inspiration of the Bible, XIII. 154.

Circulation of the Bible, 262 sup.

The above-named articles, many of them long, and all the work of Biblical scholars of high repute, if read in the order named will constitute a complete course of study in Bible history and criticism. Theologians and advanced students will recognize at once their great interest and value.

Shorter Articles.

The *Britannica* also contains innumerable briefer articles on subjects concerning which every Bible reader desires to be informed. The following is a partial list of such articles arranged alphabetically, according to the volumes in which they occur:

Volume I.—Aaron, the first high priest, p. 3; Abel, the first man slain, p. 33; Abimelech, the title of certain kings in Palestine, p. 49; Abraham, the "father of the faithful," p. 52; Absalom, the rebellious son of David, p. 56; Adam, the first man, p. 135; Ahab, the wicked king of Israel, 420; Ahasuerus, king of Persia, p. 421; Amos, one of the prophets, 747.

Amalekites, p. 651; Ammonites, p. 742, and Amorites, p. 747—tribes at war with the Israelites.

Abana and Parphar, p. 4; Adullam, p. 166, and Ai, p. 424—rivers mentioned in the Old Testament.

Volume II.—Athaliah, p. 827; Asa, p. 153 sup.; Apocrypha, p. 180; Ark of the Covenant, p. 539; Ararat, p. 309.

Volume III.—Balaam, p. 258; Baruch, p. 404; Belshazzar, p. 553.

Volume IV.—Cain, p. 642; Canaanites, p. 763; Cana of Galilee, p. 762.

Volume V.—Canticles, p. 32; Chronicles, p. 706.

Volume VI.—Daniel, p. 803; David, p. 836.

Volume VII.—Deluge, p. 54; Decalogue, p. 15.

Volume VIII.—Eli, p. 133; Elijah, p. 134; Elisha, p. 140; Emmaus, p. 177; Enoch, p. 449; Esau, p. 533; Esdras, p. 541; Esther, p. 560; Eve, p. 733; Ezekiel, p. 828.

Volume X.—Galilee, p. 27; Gath, p. 108; Gilead, p. 594; Goshen, p. 788; Gideon, p. 588; Gog, p. 738; Bible Glosses, p. 687; the Gospels, p. 789.

Volume XII.—Hittites, p. 25; Hosea, p. 295.

Volume XIII.—Isaiah, p. 377; Israel, p. 396; Jeremiah, p. 626; Jesus Christ, p. 656; Jesus, son of Sirach, p. 672; Job, p. 697.

Volume XIV.—Lamech, p. 238.

Volume XV.—Manna, p. 493; Mark, p. 551; Mary, p. 589; Matthew, p. 633.

Volume XVI.—Messiah, p. 53; Micah, p. 224; Michael, p. 226; Midian, p. 284; Moab, p. 533, Moloch, p. 695; Moses, p. 860.

Volume XVII.—Nahum, p. 165; Naphtali, p. 174; Nathanael, p. 242; Nehemiah, p. 320; Nimrod, p. 511; Nebuchadnezar, p. 309.

Volume XVIII.—Paul, p. 415; Peter, p. 693; Pharaoh, p. 730; Philemon, p. 741; Philip, p. 742; Philistines, p. 755.

Volume XX.—The land of Rameses, p. 265.

Volume XXI.—Sabbath, p. 124; Samaria, p. 243; Samaritans, p. 244; Samuel, p. 252; Samson, p. 252.

Volume XXII.—Simeon, p. 77; Simon Magus, p. 78; Sinai, p. 88; Solomon, p. 251; Synagogue, p. 811; Susa, p. 722.

Volume XXIII.—Thomas, p. 308; Timothy, p. 399; Titus, p. 420; Tobit, p. 427.

Of the articles which relate to the geography of the Bible, the following are a few of the most important:

Sinai, celebrated as the place where Moses received the law, XXII. 88.

Palestine, the "Promised Land," XVIII. 170, and XIII. 400.

Jerusalem, the holy city, XIII. 636.

Dead Sea, together with an account of the two cities, Sodom and Gomorrah, which are said to have occupied its site, VII. 1.

Bible Geography.

Hebron, the ancient capital of Judea, XI. 608.

Bethlehem, the city of David, III. 617.

Bethany, the "town of Mary and Martha," III. 617.

Beer-sheba, the most southern town of Palestine, III. 504.

Samaria, XXI. 243.

Shechem, XXI. 783.

Nazareth, the town where Jesus lived, XVII. 302.

Gennesaret, otherwise called the Sea of Galilee, X. 29.

Capernaum, V. 54.

Joppa, XIII. 746.

Antioch, II. 130.

Damascus, the oldest city in the world, VI. 790.

The journeyings of the Israelites from Egypt to the Promised Land may be traced by reading the following references in their order: Starting from Rameses in Egypt,

XX. 265, they fled to the Red Sea, XIII. 399. Here Pharaoh and his host were overthrown and drowned, but the Israelites, having crossed in safety, pursued their journey through the wilderness. For three days they had no water to drink, and arriving at last at Marah, XIV. 767, they found that the water in the springs there was bitter. This water was miraculously made sweet, and they continued their journey, finally reaching Sinai, XXII. 88, where the law was delivered to Moses. From Sinai they passed by various stations to Kadesh-Barnea, XXII. 821, and from that place sent out twelve spies to view the Promised Land. Being afraid to enter the Promised Land they then turned back into the wilderness where they wandered for forty years. At Mount Hor, XII. 159, Aaron died. While passing around Edom, XII. 699, they were attacked by fiery serpents. Arriving at last on the plains of Moab, XVI. 533, the Israelite army was reviewed and the law was confirmed by Moses. Moses viewed the Promised Land from the top of Mount Pisgah and died there. After this, the people under Joshua crossed the Jordan, XIII. 746, encamped a short time at Gilgal, X. 596, and then marched against Jericho, XIII. 629, and Ai, I. 424. At Shechem, XXI. 783, they again encamped, and there the cursings were read from Mount Ebal, X. 444, and the blessings from Mount Gerizim, XXI. 244. Returning to Gilgal, a treaty was made with the people of Gibeon, X. 583. At Merom, XIII. 746, the Northern Canaanites were signally defeated; and at Shiloh, XXI. 803, the twelve tribes were assigned to their respective possessions.

Journey from Egypt.

In much the same way we may follow the Apostle Paul in his voyage to Rome. He sets sail from Cæsarea, IV. 639; touches at Sidon, XXII. 35; thence proceeds to Cyprus, VI. 747, and to Myra, XV. 93, where he is tran-

shipped to a corn vessel which coasts along the shore of Asia Minor to Cnidus, V. 44. Being caught by the wind, the vessel is driven to Crete, VI. 569, and follows the southern coast of that island to Fair Haven, VI. 570. Sailing thence to find a secure harbor for the winter, the vessel encounters the wind Eurokylon, XV. 340; and, under shelter of the island Clauda, VI. 570, the sailors prepare for the storm by striking sail and turning the vessel's head to the wind. For fourteen days they are driven helpless across the sea, and are finally thrown upon the shore of Melita, XV. 840, escaping only with their lives. After three months, Paul sets sail in an Alexandrian corn ship, stops at Syracuse, XXII. 813, for three days; then, making circuit, passes Rhegium, XX. 341, and the next day lands at Puteoli, XVII. 188, where he rests a full week. Then he proceeds by the Appian Way, II. 211, to the city of Rome, XX. 807.

Paul's Voyage to Rome.

It is safe to say, in conclusion, that the earnest student of the Bible will find in the *Britannica* an answer to almost every question concerning biblical subjects that may be asked. From no other single work will he be able to obtain a larger amount of useful information at so little expenditure of time and labor. The *Britannica* is, in short, the great authority to which readers and students of every denomination or creed may turn with full confidence in its correctness and impartiality. See the chapter entitled *The Theologian*, page 219, of this volume.

CHAPTER XVII.

READINGS IN MYTHOLOGY, LEGENDS, TRADITIONS AND FOLK LORE.

"Books are our household gods."—*January Searle.*
"Cultivate above all things a taste for reading."—*Lord Sherbrooke.*

I. MYTHOLOGY.

MYTHOLOGY is the science which examines the myths of cosmogony and of gods and heroes. A very scholarly exposition of this science is given by Andrew Lang in Volume XVII. pp. 135–154, of the *Britannica*. Students, however, who are not already somewhat familiar with the subject, will prefer to read some of the shorter articles first; they will afterwards be able to take up this entertaining and comprehensive disquisition and read it with appreciation and delight. The following list includes a number of interesting and valuable articles, arranged for the most part in alphabetical order:

Definition.

Myths of the creation, VI. 446, and XVII. 156. Read also the chapter on cosmogonies, I. 460.

Myths of the gods:

Apollo, II. 185.
Athena (Minerva), II. 830; XVI. 437.
Diana (Artemis), II. 643; VII. 167.
Hebe, XI. 490.
Hephaestus (Vulcan), XI. 679.
Juno, XIII. 778, (Hera), XI. 679.

Greek and Roman.

Jupiter, XIII. 779.
Mars, XV. 569, (Ares) II. 484.
Marsyas, XV. 575.
Mercury (Hermes), XI. 749; XVI. 530.
Nemesis, XVII. 331.
Neptune (Poseidon), XVII. 345; XIX. 558.
Saturn, XXI. 320.
Venus (Aphrodite), II. 171.
Vesta, XXIV. 193.
Zeus (Jupiter), XXIV. 782.

Northern.
The Aesir, I. 209.
Odin, II. 68; XVII. 156.
Frey, I. 210.
Balder, III. 275.
Niörd, I. 210.
Bragi, I. 211.
Asgard, II. 679.
Thor, XVII. 156.
Freya, IX. 777.
Loki, XVII. 474.
Heimdal, I. 211, etc.

Other Gods.
Bel, III. 175.
Ashtoreth, II. 735.
Astarte, II. 735.
Merodach, XXIII. 237.
Ammon, I. 740.
Anubis, II. 146.
Bubastis, IV. 408.
Baal, III. 175.
Moloch, XVI. 695.
Ahriman, I. 424.
Dagon, VI. 761.

Anoukis, II. 90.
Athor, III. 13.
Buto, IV. 590.
For further references, see the chapter entitled *The Theologian*, page 220, in this volume.

II. LEGENDS.

Old Greek Stories.

1. Closely allied to the myths of the gods—in fact, inseparable from them—are the legends of the ancient heroes. All are related in the *Britannica*, with now and then a pertinent inquiry respecting their origin, or a brief discussion concerning their interpretation. Here you may find the story of Achilles, whose "vengeful wrath brought woes numberless upon the Greeks," I. 94; of Acis and his love for the nymph Galatea, I. 98; of Actæon hunted by his own hounds, I. 129; of Adonis beloved by Venus, I. 163; of Adrastus and the war of the Seven against Thebes, I. 164; of Æacus, famed for his integrity and piety, I. 179; of Ægeus, the king of Athens, and of Ægina, the river-nymph, I. 180; of Ægis, the buckler of Jupiter, I. 181; of Ægisthus, the traitor, I. 181, and his betrayal of Agamemnon, "king of men," I. 273; of Æneas and his flight from Troy, I. 182; of Ajax Telamon and Ajax Oïleus and their bold exploits, I. 432; of fair Alcestis giving herself up to death to save the life of her husband, I. 459; of Alcinous and his Phæacian people, I. 468; of Alpheus, the river-god I. 615, and his adventure with the nymph Arethusa, II. 485; of the Amazonian women, I. 655, brave warriors of the Colchian shore; of Amphiaraus, I. 749, whose prophetic power did not save him from an early death; of Amphion, I. 774, the sound of whose lyre caused stones to move and form themselves into the walls of Thebes; of Amymone and the satyr, I. 782.

This takes us only through the first volume. Of the numerous classical legends narrated in the remaining volumes, it is unnecessary to name all. Any course of reading on this subject, however, ought to include the following:

Other Classical Legends.

Anchises, the father of Æneas, II. 3.

Andromache, the wife of Trojan Hector, II. 22.

Andromeda, saved by Perseus from the jaws of a sea-monster, II. 22.

Antaeus, giant and wrestler, overcome by Hercules, II. 100.

Antigone, the heroine of one of the most famous of the old Greek tragedies, II. 127.

The Argonauts and their famous voyage in search of the Golden Fleece, II. 497.

Ariadne, the fair maiden of Crete, II. 501.

Arion, the Greek bard and player on the cithara, II. 502.

Atalanta, the swift-footed huntress of Arcadia, II. 826.

Atreus, the father of Agamemnon, III. 50.

Atys, the beautiful shepherd of Phrygia, III. 65.

The autochthones, aborigines of Greece, III. 141.

Cadmus, the inventor of letters, IV. 629.

Calchas, the wisest of soothsayers, IV. 653.

Calliope, the Muse of epic poetry, IV. 709.

The centaurs, or "bull-killers," fabled as creatures half man and half horse, V. 340.

Cerberus, the three-headed dog that guards the gates of Hades, V. 345.

Cupid and Psyche, VI. 708.

The cyclopes, a lawless race of one-eyed monsters, VI. 744.

Daedalus, the most famous artisan of prehistoric times, VI. 760.

Daphne, beloved by Apollo, VI. 821.

Danaë, the mother of Perseus, VI. 797.
Danaüs and his fifty daughters, VI. 797.
Deucalion, the Noah of the Greeks, VII. 134.
Dodona and its famous oaks, VII. 322.
Echo and her love for Narcissus, VII. 640.
Elysium, or the abode of the blessed, VIII. 156.
Endymion, and his perpetual sleep, VIII. 204.
The Epigoni, sons of the seven heroes who perished at Thebes, VIII. 477.
The Erinyes, or Furies, VIII. 524.
The Fauns, IX. 53.
Ganymede, the cup-bearer of Zeus, X. 72.
The Giants, X. 571.
Glaucus, the fisherman who became a god, X. 676.
The Gorgons, X. 784.
The Graces, XI. 26.
The Harpies, XI. 490.
Hercules, the greatest of the heroes, XI. 725.
Hero and Leander, XI. 754.
The Hesperides, daughters of the West, XI. 778.
Iphigeneia, XIII. 211.
Jason, the leader of the Argonauts, XIII. 596.
Hyacinthus, the friend of Apollo, XII. 420.
Laocoön, the unfortunate Trojan crushed by serpents, XIV. 292.
The Lapithae, ancient race of Thessaly, XIV. 300.
Linus, who taught Hercules music, XIV. 678.
Medea, the enchantress, XV. 776.
Medusa, the Gorgon, X. 785.
Midas and the "golden touch," XVI. 278.
Milo, the wrestler, XVI. 323.
Minos and the Labyrinth of Crete, XVI. 478.
The Nymphs, XVIII. 688.
Nestor, oldest of Grecian heroes before Troy, XVII. 354.

Orpheus, the sweetest of all musicians, XVIII. 51.
Odysseus, or Ulysses, XVII. 729.
Pegasus, the winged horse of the Muses, XVIII. 468.
Pelias, king of Iolcos by the sea, XVIII. 474.
Phaethon, son of Helios, XVIII. 727.
Theseus, the great Athenian hero, XXIII. 294.
Romulus, the mythical founder of Rome, XX. 840.
The Trojan war, XXIII. 584.

2. Of old English legends intimately associated with much that is best in our literature, there are several with which every student should be familiar. Among these are the following:

English Legends.

King Arthur and his Knights of the Round Table, II. 649.
Lancelot of the Lake, XX. 644.
Merlin, the wizard, XX. 645.
Guy of Warwick, XI. 341.
Sir Bevis of Hampton, XX. 653.
Godiva, the fair lady of Coventry, VI. 530.
Fair Rosamond, XX. 848.
Whittington and his Cat, XXIV. 556.

3. Of Christian legends, some of the most interesting are:

Christian Legends.

Saint Cecilia, V. 284.
Saint Christopher, V. 704.
The Holy Grail, XI. 34.
Saint Nicholas, XVII. 482.
Saint Denis, VII. 79.
Saint Veronica, XXIV. 174.
Seven Sleepers of Ephesus, XXI. 697.

4. Of other famous legends the number is too great for anything like a complete list to be given. Among those

referred to or narrated in the *Britannica* the following may be mentioned:

Miscellaneous.

Adam's Peak in Ceylon, I. 140.
The Tower of Babel, III. 178.
The story of Lohengrin, XXIV. 314.
Roland, the great French hero, XX. 626.
The Cid, famous in Spanish story, V. 773.
Ogier, the Dane, XX. 652.
Prester John, King of Abyssinia, I. 65; XIX. 714.
The legend of Dr. Faustus, IX. 54.
Legends of Atlantis, III. 27.
William Tell, XXIII. 155.
The Beast Epic of Reineke Vos, VIII. 838.
The Pied Piper of Hamelin, XI. 409.
The Nibelungen Lied, XVII. 474.

The legends peculiar to different countries are also noticed in their appropriate places, as:

Legends of Afghanistan, I. 238.
Legends of Arabia, II. 255.
Legends of Central America, I. 703, etc.

5. *Fairy Stories.*—For special article, see VIII. 854. See also the following sections, paragraphs, and short articles:

Fairies, II. 203.
Brownies, II. 204.
Fairies in Celtic literature, V. 325.
Morgan, the Fay, V. 325.
Oberon, XVII. 704.

6. *Fables.*—See special article, VIII. 837.
Sanscrit fables, XXI. 287.
Æsop, the Greek fabulist, I. 212.
La Fontaine, the French writer of fables, XIV. 204.
Kriloff, the Russian collector of fables, XIV. 148.

CHAPTER XVIII.

READINGS IN THE STUDY OF THE SUPERNATURAL.

"To make modern and familiar, things supernatural and causeless."
—*All's Well that Ends Well.*

Occult Sciences.

IN this chapter it is proposed to point out to the reader a few of the most interesting articles in the *Britannica* relating to supernatural phenomena, the occult sciences, magic, mystery, superstition, etc. No attempt will be made towards a classification or logical arrangement of the subjects, nor is it possible to present anything approaching to a complete list of the articles and parts of articles which relate directly or indirectly to the supernatural. But it is believed that every student will find in these readings matter that will afford entertainment, and sometimes instruction.

Before the era of modern science, the belief in the supernatural held a much larger place in the estimation of mankind than it is possible for it to hold again. Alchemy, astrology and magic reigned undisputed, and all knowledge of whatsoever kind was tinctured with superstition. Let us begin our readings, therefore, with selections from articles relating to these defunct sciences.

Alchemy.

1. Alchemy has been very aptly described as "the sickly but imaginative infancy through which modern chemistry had to pass before it attained its majority." See the very interesting article on this subject, I. 459-467. Read also the following articles and selections:

Paracelsus, XVIII. 234.

Jakob Böhme III. 852.
Hermes Trismegistus, XI. 750.
Alexander of Aphrodisias, I. 486.
Roger Bacon, III. 218; I. 186.
Albertus Magnus, I. 453.
Cornelius Agrippa, I. 418.
Raymond Lully, XV. 63.
Arnold of Villeneuve, II. 620.
The Rosicrucians, XX. 852.
Alembic, I. 477.

2. Astrology was the forerunner of the modern science of astronomy, and, like alchemy, was not altogether unproductive of good results. For a general history of this interesting subject, see the special article on the subject in volume II. 739–743. Also, consult the following short articles:

Astrology.

Horoscope, XV. 206.
Zodiac, XXIV. 791; VII. 550.
William Lilly, XIV. 642.
Nostradamus, XVII. 596.
Robert Fludd, IX. 349.
John Dee, VII. 22.
Michael Scott, XXI. 470.
Girolamo Cardan, V. 90; II. 742.
Napier's belief in Astrology, XVII. 183.
Astrology among the Parsees, XVIII. 325.

3. An important article on magic, its history and influence, may be found in XV. 199.

Magic and Witchcraft.

Magic among Prehistoric Nations, VIII. 623.
Egyptian Magic, XV. 201.
Babylonian and Assyrian Magic, XV. 201.
Greek and Roman Magic, XV. 202.
Magic among Asiatic Nations, XV. 203.

Magic in Christendom, XV. 204.

Divination, or the art of discovering secret or future things by preternatural means, VII. 293.

Superstitious Beliefs.

Augury, or the art of discovering through natural signs the will of the gods, III. 72.

Ordeal, or the mediæval method of discovering the will of God, XVII. 820.

Demonology, or the influence of spiritual beings upon the affairs of men, VII. 60.

Sorcery, or familiar intercourse with demons, VII. 63.

Witchcraft, XXIV. 619. (A history of the laws and methods by which different nations have attempted to suppress this supposed crime.)

Exorcism, or the means by which evil spirits are expelled, VIII. 806.

Lycanthropy, or the metamorphosis of men into wolves, XV. 89.

Mysticism.

The mystical arrangement of letters, called Abracadabra, I. 52.

The mystical word Abraxas, I. 56.

The mystical ornament or charm, Amulet, I. 780.

The mystical science, Kabbalah, XIII. 810.

Evil Spirits.

Beelzebub, III. 503.

Asmodeus, II. 714.

Mephistopheles, XVI. 29.

Faust, the sorcerer of mediæval legend, XI. 54; X. 539.

Merlin, the wizard of Britain, XX. 645.

Apollonius of Tyana, philosopher and magician, II. 188.

Reginald Scot, English writer on witchcraft, XXI. 470.

Cotton Mather, the New England opponent of witchcraft, XV. 631.

5. The history of the belief in supernatural beings and

in supernatural influences may be further illustrated by reference to the following articles:

Super-natural Influences.

Angels, II. 26; II. 183.
Apparitions, II. 202.
Ghosts, II. 205; XV. 199.
Spiritualism, II. 207; XXII. 404.
Fetichism, II. 45.
Totemism, XXIII. 467.
Prophecy, XIX. 814.
Inspiration, XIII. 154; XIX. 197.
Second Sight, II. 202. See also Hypnotism, II. 505; and Mesmerism, XV. 277.
The Sibyllines, XXII. 13; XI. 144. See also Augurs, III. 72; Oracles, XVII. 808; XIX. 91.
Apotheosis, II. 199. See also Metempsychosis, XVI. 106.

6. The popular belief in imaginary creatures, as set forth in very many of the classical legends, in the romances of the Middle Ages, and in the fairy tales and folk-lore of almost every nation in the world, is the subject of numerous articles.

Imaginary Beings.

The following are especially noticeable:
Nymphs, XVII. 688.
Dryads, VII. 487.
Fauns, IX. 53.
Chimæra, V. 626.
Harpies, XI. 490.
Mermaids and mermen, XVI. 89.
Griffin, XI. 195.
Dragon, VII. 385.
Were wolves, XV. 89.
Fairies, VIII. 854.
Oberon and Titania, XVII. 704.
Morgana, V. 325.
Elves, VIII. 855.

CHAPTER XIX.

THE DESULTORY READER'S COURSE.

"Read what amuses you and pleases you."—*Robert Lowe.*
"Adjust your proposed amount of reading to your time and inclination."—*Dr. Thomas Arnold.*

Reading for Pleasure.

To the person who takes pleasure (and who does not?) in browzing among the good things in books, without undertaking to read systematically, the *Encyclopædia Britannica* offers advantages which can be derived from no other publication. Here may be found all kinds of literary nuggets—readings on all manner of subjects—short articles, long articles—anything and everything to suit the demands of the hour. You need not attempt to follow any special course of reading—only read that which pleases you, and you may be sure that, whatever you may select from the *Britannica*, you cannot fail to be improved thereby. If your time is limited, choose something that is brief and light; if you are in a studious mood, take up a subject that will make you think, and that will be to your mind what brisk exercise is to your body. Among the thousands of articles with which you may thus occupy your spare moments, the following are mentioned merely as examples:

I. CURIOUS INVENTIONS, ETC.

Inventions.

The automaton, III. 142.
The magic lantern (fully illustrated), XV. 211.
The guillotine, XI. 263.
Tunnelling, XXIII. 622 (illustrated).

Wax figures, XXIV. 460.
Horn-books, XII. 170.
Perfumery, XVIII. 525.
Patchouli, 1209 sup.
Fire engines, IX. 235.
Horology, 854 sup.
Fire works, XX. 134.
Flying machines, I. 185.

2. NATURAL CURIOSITIES, SCENERY, ETC.

Nature.
The Luray cavern, XV. 67.
The Mammoth cave, XV. 448.
Niagara Falls, XVII. 472.
Whirlpools, XXIV. 540.

Whirlwinds and tornadoes, XVI. 129.
Geysers, X. 557.
Glaciers, X. 626.
Natural gas, 1111 sup.
Giants' causeway, X. 527.
Tides, XXIII. 353.

III. STRANGE ANIMALS AND PLANTS.

Prehistoric monsters, XII. 695.
The ichneumon, XII. 629.
The dodo, VII. 321.
The honey guide, XII. 139.
The sloth, XXII. 161.
Sea serpents, XXI. 608.
Mermaids, XV. 89.
Dragons, VII. 385.
Chimæra, V. 626.

Trees.
Harpies, XI. 490.
Baobab Tree, I. 268.
Sacred Fig, IX. 154.

Upas Tree, XXIII. 859.
Orchids, XVII. 816.

IV. CURIOUS CUSTOMS, ETC.

Deodands, VII. 727.
Ordeal of Fire and of Battle, XVII. 820.
April Fool Day, II. 214.
Curious Customs. May Day in Old England, XV. 647.
The Morris Dance, XVI. 846.
Caste, V. 186.
Clans, V. 799.
Saturnalia, XXI. 321.
Exorcism, VIII. 806.
Suttee, XXII. 727.
Fehmic Court (a secret tribunal in Germany, twelfth to sixteenth century), IX. 63.
Pillory, XIX. 95.
Funeral rites, IX. 824; burial, IV. 537; embalming, VIII. 158; mummies, XVII. 20; cremation, VI. 565.
The Nile Festival, VII. 727.

V. HISTORY AND BIOGRAPHY.

History of Flags, IX. 276.
Guilds, XI. 259–262.
The Man of the Iron Mask, XIII. 360.
Historical. History of Newspapers, XVII. 42.
Piracy, XIX. 116.
Joseph Scaliger, "the greatest scholar of modern times," XXI. 362.
The Admirable Crichton, VI. 577.
Kaspar Hauser, XI. 523.
A Roman Triumph, XXIII. 577.
Hypatia, XII. 596.
Semiramis, XXI. 639.

Aspasia, II. 714.
Field of the Cloth of Gold, II. 480.
The Spanish Armada, II. 543.
Great fires: in London, XIV. 826; in Chicago, V. 611; in Boston, IV. 75.

VI. MISCELLANEOUS.

People and Things.

James Holman, the blind traveller, XII. 103.
Zerah Colburn, the mathematical prodigy, VI. 486.
Dwarfs, VII. 567.
Siamese Twins, XVI. 765.
Heredity, I. 87.
Animal Magnetism, XV. 277.
Hypnotism, 877 sup.
The Malthusian Doctrine, XV. 344.
Darwinism, XXIV. 77–85.
Cryptography, VI. 669.
White Magic (sleight of hand), XV. 207. See also Legerdemain, XIV. 414.
Thugs, XXIII. 326.
Assassins, II. 722.

PART III.

THE BUSY WORLD.

CHAPTER XX.

THE MANUFACTURER.

"Active doer, noble liver,
Strong to labor, sure to conquer."
—*Robert Browning.*

FEW subjects engage the attention of so large a number of busy men as does that of manufacturing. Who, indeed, is not either directly or indirectly interested in the making of things, either by hand or by machinery? You may not be a manufacturer yourself, but you are necessarily the patron of many manufacturers. You are the consumer of the products of various manufacturing industries, and very naturally you have a curiosity to know something about the processes by which these products have been evolved from raw material and made into their present forms of usefulness. The *Encyclopædia Britannica* will give you the desired information.

Maker or Consumer.

If you are engaged in some particular line of manufacturing, the *Britannica* will add to your knowledge concerning it. It will tell you what are the best materials to be used, the most economical processes to be employed, and the most desirable qualities to be sought in the products which you design to manufacture. Besides this, it will probably give you a great deal of interesting historical information concerning the origin, development, and various fluctuations of the business in which you are en-

gaged—information which, although not absolutely necessary to your success, may nevertheless add directly to your enjoyment and incidentally to your prosperity.

This subject covers so wide a field and embraces so many different industries that, within our limited space, we can do but little more than make bare references to some of the most important articles contained in the *Britannica*. Let us first notice some of the manufactures of

TEXTILE PRODUCTS.

1. Wool and Woolen Manufactures is the title of a special article, XXIV. 653. The first part of this article, relating to the early history of the woolen industry, will interest every reader. See next the article on wool in 1637 sup., where the very latest information and statistics are given. Now read what is said of

Wool.

Wool fibre, IX. 133.

Bleaching of wool, III. 822.

Dyeing of wool, VII. 571.

Turn to the illustrated article on TEXTILES, XXIII. 206, and read the interesting history there given of the art of weaving.

2. For an account of flax and linen manufactures, see XIV. 663.

Flax.

The manufacture of linen in England, VIII. 232; in Ireland, II. 143, and XIII. 231; in Scotland, VII. 534.

Cultivation of flax in America, I. 64.

Bleaching of linen, III. 820.

3. For a complete history of cotton and cotton manufactures, see VI. 482.

Cotton in the United States, 824, 666 sup.; in India, XII. 748; in Egypt, VII. 708, 786; in Brazil, IV. 227.

Cotton.

Cotton manufacture in the United States, 512 sup.; in England, VIII. 230; in India, XII. 761, 763; in Russia, XXI. 849.

Bleaching of cotton, III. 812.

Dyeing of cotton, VII. 576.

Cotton-spinning frame, II. 541.

Robert Owen's improvements in cotton spinning, XVIII. 87.

Cotton yarns, XXIV. 731.

The spinning jenny, II. 541 and VI. 490.

The spinning wheel, XXIV. 664.

Calico, VI. 488, 500.

Calico printing, IV. 684.

Ginghams, X. 604.

Gauze, X. 118.

Laces, XIV. 183.

4. For a history of silk and silk manufactures, see XXII. 56, 61.

Manufacture of silk in the United States, 1429 sup.; in England, VIII. 232; in India, XII. 761; in China, V. 638; in France, IX. 520; in Italy, XIII. 442.

Silk.

Silk in ancient times, XXIII. 208.

Bleaching of silk, III. 822.

The silkworm, IV. 596 and XIII. 151.

Silk from spiders, II. 295.

5. Miscellaneous.

Hosiery, XII. 299, and VIII. 233.

Knitting, XIV. 127.

Limoges ware, XIV. 651.
Sevres ware, XIX. 637.
Glass, history of, X. 647; manufacture of, X. 650; annealing, II. 63; colors of, XXIV. 427; painting on, X. 667.
Glass.
Venetian glass works, XVII. 48.
Glass cutting, VII. 167.
Plate glass, X. 662.
Window glass, X, 660, 668.
Glass bottles, IV. 167, and X. 664.
Mirrors, XVI. 499.
Improvements in glass making, 439 sup.
Straw Manufactures, XXII. 593.
Leather, XIV. 380; artificial leather, XIV. 391; new process, 980 sup.; shoemaking, XXI. 830.
Leather, etc.
Paper, XVIII. 217.
Papier-mâché, XVIII. 228.
Parchment, XVIII. 271.
Linoleum, XIV. 676.
Lincrusta Walton, XIV. 662.
Button making, IV. 599.
Brick making, IV. 280; ancient bricks, XIX. 604, 619; glazed brick, XVII. 35.
Tiles, XXIII. 387, IV. 283.
Gutta Percha, XI. 337.
India-Rubber, XII. 835, 839; Goodyear's inventions, 766 sup.
Baskets, III. 421.
Needles, XVII. 313.
Pigments—methods of manufacturing paints, XIX. 85.
Hats, XI. 518; straw hats, XXII. 593.
Gloves, X. 692, XIV. 389.
Pins, XIX. 97.

Fans, IX. 27.

Furniture, IX. 847.

Very interesting are the accounts that are given of some of the great manufacturing centres, such as:

Manchester, the centre of the English cotton industry, XV. 459.

Birmingham, noted for its iron and steel works, III. 780.

Sheffield, famous for its cutlery, XXI. 785.

Philadelphia, and its extensive and varied industries, XVIII. 736.

Pittsburg, and its iron manufactures, 1239 sup.

Lowell, and its cotton mills, 1027 sup.

Lynn, famous for the manufacture of shoes, 1031 sup.

Boston, IV. 72; Newark, XVII. 370; Wilmington, XXIV. 589; Birmingham, Alabama, III. 287; and scores of other manufacturing cities of similar importance.

Statistics.

For statistics and other information concerning manufactures in all the principal countries of the world, see the appropriate paragraph under the name of each country. For example:

Manufactures and industries in the United States are especially noticed in the supplement, beginning on page 1560.

Manufactures in England, VIII. 230.

Manufactures in Germany, X. 459.

Manufactures in Arabia, II. 245.

But the intelligent reader will require no further assistance from the GUIDE in finding such information.

CHAPTER XXI.

THE MERCHANT.

"Many times the reading of a book has made the fortune of a man—has decided his way of life."—*R. W. Emerson.*

COMMERCE, in its broadest signification, is traffic in goods. This traffic may be on a large scale, or a small scale; it may be conducted entirely within one's own country, or it may extend to foreign lands. To the merchant who is engaged in such traffic, the *Encyclopædia Britannica* affords information which it would be difficult for him to obtain from any other source. In the first place, there is no commodity in which he deals that it does not fully describe. If his specialty is dry-goods, he has but to turn to the *Britannica* to learn all about silk, XXII. 56; satin, XXIV. 464; calico, VI. 488; gingham, X. 604; woolens, XXIV. 653; thread, VI. 502; and the hundreds of other articles on his shelves. If he is a grocer, he may learn with equal facility all about coffee, VI. 110; tea, XXIII. 97; spices, XIX. 97; sugar, XX. 622; and the numberless commodities of his trade. And so, no matter what department of merchandise may be his, he will find that the pages of the *Britannica* are teeming with information for him. It is unnecessary for the GUIDE to specify further in this direction. Any desired article having reference to the various

Dry Goods.

Groceries.

kinds of merchandise may be readily found by consulting the Index volume. It is rather with the general features of merchandising, or of commerce, that we propose to deal in this chapter.

Commerce.

Every merchant (and thousands of people who are not merchants) will be attracted by the very interesting article on COMMERCE in the sixth volume of the *Britannica*. This article is largely historical in character, and embraces, among other topics, the following:

Antiquity of commerce, p. 196.
Free trade in Great Britain, p. 205.
Tariffs, p. 203.
Increase of international trade, p. 203.

Now, as to the antiquity and history of commerce, we may learn still more by referring to the chapter on commerce and industry, VIII. 617, and to sections relating to trade under the heads of Arabia, Phœnicia, etc.

Free Trade.

For additional information concerning free trade and tariffs, together with a full discussion of the questions relating to them, see the following articles:

FREE TRADE, IX. 752.
Customs duties, VI. 729.
United States tariff legislation, 1473 sup.
Economic System of Free Trade, IX. 721.

For the history and present status of international trade, see the section relating to trade under the head of each country. For example:

Trade of Algeria, I. 565.
Trade of Arabia, II. 245.
Trade of Argentine, II. 495.
Trade of Austria, III. 121, etc., etc.
See also, Imports and Exports, XVII. 247.

For the modes of transporting goods from one place to another, read the following:

Carriers. Carrier, V. 138.
Caravan, V. 83.

CANALS, IV. 782; ship canals, IV. 787; Panama canal, XVIII. 209; Suez canal, XXII. 620; history of inter-oceanic canals, 912 sup.; the Nicaragua project, XVII. 1136; statistics of canals in the United States, 1115 sup.

Express carrying system, 657 sup.

Railroads (see chapter in this volume entitled, *The Railroad Man*).

SHIPS (see chapter entitled, *The Seaman*).

Shipping of United States, XXIII. 826.

Among other topics of special interest to the merchant, the following are mentioned merely as samples of the kind of information to be found in the pages of the *Britannica:*

Miscellaneous.

Account, I. 91.
Adjustment, I. 154.
Agent I. 280.
American fur trade, 72 sup.
Arbitrage, II. 311.
Average, III. 145.
Bill of Lading, III. 674.
Bill of sale, III. 674.
Corn trade, VI. 413.
Cotton trade, VI. 487.
Company, VI. 221.
Contraband, VI. 320.
Exchange, VIII. 783.
Excise, VIII. 797.
Insurance, XIII. 161.
Silk trade, XXII. 64.
Trade marks, XXIII. 498.

Trade unions, XXIII. 499.

Money. Early history of money, VI. 196; cowry shells used for money, VI. 535; wampum, 1610 sup. See also the chapter in this volume entitled *The Banker*.

For reading in leisure hours there are few subjects more interesting than the lives of famous men who have achieved success in their respective callings. There have been many great merchants whose biographies are well worth perusal. Read the accounts given in the *Britannica*, of

Leisure Reading.

Sir Richard Whittington, "thrice lord mayor of London," XXIV. 555.

Sir Thomas Gresham, founder of the Royal Exchange, XI. 186.

John Jacob Astor, the great fur merchant of America, II. 737.

Stephen Girard, the merchant philanthropist of Philadelphia, X. 621.

Robert Morris, the American patriot, XVI. 846.

George Peabody, merchant and philanthropist, XVIII. 442.

The following subjects are also of more than passing interest to persons engaged in mercantile pursuits:

Merchants of the Steelyard, London, XXII. 528.

The Company of Merchant adventurers, XXI. 826.

South Sea Company, VI. 221.

John Law and the Mississippi Scheme, IX. 584; XIV. 367.

Hudson's Bay Company, XII. 333.

East India Company, II. 701.

Dutch East India Company, X. 186.

Laws affecting Merchant Seamen, XXI. 650.

CHAPTER XXII.

THE BANKER.

"Seest thou a man diligent in business? He shall stand before kings."—*Proverbs of Solomon.*

IN this chapter it is proposed to point out a few of the articles in the *Britannica* which relate to the kindred topics, money and banking, with a brief notice of national finance.

1. The article entitled MONEY, XVI. 720–738, may serve as the starting point and basis of our studies. Among other topics it treats (1) of the causes which determine the value of money; (2) of early forms of currency; (3) of metallic forms of money; (4) of coinage; (5) of depreciations among various nations and at various times; (6) of the production of the precious metals; (7) of various questions regarding metallic money; (8) of the coinage systems of continental Europe; (9) of the conflict of standards. The arguments for and against bimetallism are briefly but clearly stated.

Money.

Read next certain sections of the article on Numismatics, the science of coins, XVII. 628–661. Here, under separate heads, may be found the history of Greek coins, page 631; of Roman coins, page 652; of mediæval and modern coins, page 654; and of oriental coins, page 659. Continuing the study of the metallic forms of money, see the following:

Specia. advantages of silver and gold, XVI. 723.

Bullion, IV. 518.

Mints, XVI. 480–490. This article gives a complete description of the operations employed in the manufacture of gold and silver coins. It also relates the history of coinage from the earliest stages of civilization to the present time. A supplementary article, 1090 sup., gives a brief account of the mints and coinage of the United States.

Coinage.

Decimal coinage is treated in a separate article, VII. 20. For further questions connected with coinage, see XVI. 724; also, silver coinage, XXII. 71; comparative value of silver and gold, XXII. 73.

Bimetallism, 284 sup.

Statement of United States silver coinage, 1432 sup.

The silver law, 1432 sup.

World's annual product of gold and silver, 1084 sup.

2. The subject of BANKING is treated quite fully in the third volume of the *Britannica*, pages 315–341. Of particular interest is the section (pages 315–317) relating to the history of banking. Banking in the United States receives special attention in a brief chapter, III. 339, and in a carefully written supplementary article, 203 sup. Also in XXIII. 766, 776. Among other articles are the following:

Banks.

Paper currency of the United States, XXIII. 775.

Savings banks, XXI. 327; savings banks in the United States, 1383 sup.; post office savings banks, XIX. 572.

London bank clearing house, I. 91.

Clearing house certificates, 476 sup.

Bills of exchange, III. 673.

Exchange, VIII. 784.

Rates of exchange, XXIV. 52.

Cheques, V. 583.

Interest, XIII. 188; interest on bills of exchange; usury, XXIV. 17; American law on usury, 1589 sup.

Broker, V. 360.

Stock Exchange, XXII. 556.

3. The term Finance, as used in the *Britannica*, has reference to the ways and means by which the expenditures of government, general and local, are met.

Finance. The article under this head, IX. 171–191, deals with the history of finance only, and is replete with interesting and valuable information. Among other topics of a similar character, we shall find here the history of TAXATION, IX. 171, and of the various expedients resorted to by the English government for the raising of revenue.

We are now prepared for the article on Taxation, XXIII. 85, and for the brief discussion of taxation in the United States, XXIII. 827.

Taxation. Income tax, XXIII. 88; Pitt's income tax, IX. 187.

Relation of taxation to protection, IX. 755. And this brings us to the article on FREE TRADE, IX. 752–762, written by Thorold Rogers. Protection in the United States is discussed in XXIII. 754, 761, 776.

National Treasury. NATIONAL DEBT, XVII. 243; of the United States, XXIII. 747; debts of the world's chief nations, 553 sup.

Work and organization of the United States treasury, 1505 sup.

Greenbacks, XXIII. 775.

Banking system of the United States, III. 203.

See chapter XXI., *The Merchant*.

CHAPTER XXIII.

THE ARCHITECT.

"If a man read little, he had need to have much cunning to seem to know that he doth not."—*Lord Bacon.*

THE work of the architect is closely connected with that of the builder. The end of building, merely as such, is convenience or use, irrespective of appearance; but the end of architecture is, so to arrange the plan, masses, and enrichments of a structure as to impart to it interest, beauty, grandeur, unity, power. Building is a trade; architecture is an art.

Definitions.

The *Encyclopædia Britannica* is a mine of valuable information for the architect. There is scarcely any question connected with the practical application of his art which does not receive notice and discussion somewhere within its pages. The history of architecture is treated with special fulness. The leading article on this subject (in volume II. pp. 382–475) is a very complete treatise, embracing as much matter as is contained in an ordinary 12mo book of four hundred pages. It is enriched with eighteen full-page plates, besides nearly one hundred illustrations. Following it is a Glossary of Architectural Terms (especially classical and mediæval) filling sixteen double-column pages. A supplementary article on AMERICAN ARCHITECTURE, 131 sup., contains a number of designs and plans for modern dwelling houses, with much other valuable matter.

Leading Article.

The following are among the numerous subjects of in-

terest which the architect will find fully described or explained in the *Britannica:*

Prehistoric structures, II. 383; ancient remains at Karnak, V. 118, XXI. 51; Cromlechs, VI. 597; ancient stone circle at Stonehenge, XXII. 576; tumuli, III. 397; lake-dwellings, XIV. 222; crannogs, VI. 562.

Egyptian architecture, II. 384; pyramids, XX. 122, V. 582; sphinxes, VII. 772; the Serapeum, XXI. 674; labyrinth, VII. 774; tombs, VII. 781, XVI. 865; temples, VII. 786.

History of Architecture.

Jewish architecture, II. 392; temple of Solomon, XXIII. 166; of Zerubbabel, XXIII. 167; of Herod, XXIII. 168.

Indian architecture, II. 394; Taj Mahal, I. 286.

Assyrian architecture, II. 397.

Persian architecture, II. 399; Persepolis, XVIII. 557; Susa, XXII. 722.

Grecian architecture, II. 401; remains at Mycenæ, II. 346, XVII. 115; the Caryatides, II. 407; Choragic monuments, II. 411.

Three orders of Grecian architecture, Doric, Ionic, and Corinthian, II. 402; Doric, II. 409; Ionic, II. 417; Corinthian, II. 407, IV. 709.

Roman architecture, II. 414; the Pantheon, XX. 828; Colosseum, I. 774; dwellings at Pompeii, II. 420, XIX. 444.

Pointed architecture, II. 422; Gothic architecture in England, II. 425; in France, II. 429; in Germany, II. 431; in Spain, II. 432; in Italy, II. 434.

Modern Italian architecture, II. 436; St. Peter's at Rome, III. 415, II. 438.

Modern English architecture, II. 442; St. Paul's Cathedral, XIV. 837; Sir Christopher Wren, XXIV. 689, XVII. 442; Ely Cathedral, VIII. 155.

Saracenic architecture, II. 445; mosques of Baghdad, III. 232; of Constantinople, VI. 305; great mosque at Damascus, VI. 791; at Mecca, XV. 672; the Alhambra, I. 570.

Chinese architecture, II. 448.

Ancient American architecture, II. 450.

Present position of architecture, II. 452.

Among the large number of special subjects relating to practice of this art, the following will be found both valuable and interesting:

Special Subjects.

Abacus, I. 4.
Abbeys, I. 10.
Aisle, I. 430.
Almshouses, II. 459.
Apse, II. 215.
Arcade, II. 325.
Arch, II. 327.
Architrave, II. 459.
Baluster, II. 461
Baptistery, III. 352.
Basilica, III. 412.
Brackett, 328 sup.
Campanile, IV. 753.
Caryatides, II. 407.
Cathedral, V. 226.
Chantry, II. 462.
Cloister, VI. 35.
Column, II. 462.
Coping, IV. 464.
Cornice, II. 462.
Cupola, VII. 347.
Dome, VII. 347.
Dormer Window, II. 463.

Entablature, II. 391.
Fresco, IX. 769.
Monastery, I. 10.
Mosaic, XVI. 849.
Moulding, IV. 487.
Parapet, II. 469, IX. 421.

ARCHITECTURAL ACHIEVEMENTS.

Saint Peter's at Rome, II. 438.
Saint Paul's in London, XIV. 837.
York Cathedral, XXIV. 750.
Cathedral of Genèva, VIII. 154.
Famous Buildings. The Egyptian Temples, II. 388.
The Parthenon, III. 5.
The Atrium, III. 50.
The Colosseum, I. 774.
The Hindoo Temples, II. 395.
Jain Temple, I. 423.
The Taj Mahal, I. 286.
The Grand Mosque and the Kaaba of Mecca, XV. 672.
The Bastile, III. 429.
Lara Jongram, IV. 214.
Leaning Tower of Pisa, IV. 753.
Pyramid of Gizeh, XX. 124.
The Escorial, VIII. 539.
The Labyrinth, XIV. 179.

For additional references, see the following chapter entitled *The Builder*. For references to articles concerning the construction of bridges, fortifications, etc., see the chapter entitled *The Engineer*, page 182, of this volume.

CHAPTER XXIV.

THE BUILDER.

" In the elder days of art
Builders wrought with greatest care,
Each minute and unseen part:
For the gods see everywhere."

—*Longfellow.*

THE art of building is in a certain sense supplementary to the art of architecture. In its highest application it may very properly be called *practical architecture*. Building, however, is frequently employed when the result is not architectural; and in such case it is the exercise of labor to the accomplishment of a certain useful end, and cannot properly be styled an art. The successful builder ought to possess a scientific knowledge of carpentry, joinery, masonry, and all other trades connected with building; and he should have a practical understanding of the fitness, strength, durability, and resistance of all kinds of materials. The *Encyclopædia Britannica* offers a vast amount of information on all these subjects; it is, in fact, a library of useful knowledge for any person engaged in the building trades.

Practical Architecture.

The special article on BUILDING, IV. 446-513, is in itself a complete treatise on this subject. Each of the various divisions of the builder's trade is considered separately.

MASON-WORK, IV. 468.

Brick, history and manufacture of, IV. 279; ancient bricks, XIX. 604, 619; enamelled bricks, VIII. 182; glazed bricks in wall-linings, XVII. 35; brick as building material, IV. 448; strength of brick, XXII. 603; brick facings (Roman), XX. 809.

Mason-work.

Use of brick in combination with stone, II. 457.

Brick architecture in Germany, II. 432.

Brick laying, IV. 460.

Mortar, XIV. 647; how mortar is made, IV. 460.

Calcination of lime, XIII. 296.

Quicklime, XXI. 166.

Building stone, IV. 448, 469; strength of, XXII. 603; granite, XI. 48, X. 230; sandstone, X. 237; limestone, X. 232; marble, XV. 528; marble veneer, XVII. 36.

Concrete, VI. 243, and IV. 453.

Plaster-work, IV. 504.

Cements, V. 328.

Portland cement, IV. 459.

Hydraulic cement, XIV. 647.

Stone pavings, IV. 473.

Paving in bricks and tiles, IV. 466.

Paving tiles, XXIII. 389.

Mason's tools, IV. 468.

Scaffolding, IV. 457, 468.

Chimneys and flues, IV. 466.

Ventilation by chimneys, XXIV. 159.

Chimney-pieces, IV. 473.

Sewers and drains, IV. 467.

CARPENTER-WORK, IV. 476.

Carpenter's tools, IV. 476.

Flooring, IV. 452, 482, 493.

Partitions, IV. 484.

Timber, IV. 448; strength of, VII. 816, and XXII. 603; shrinkage, IV. 486.

Kinds of wood used for finishing, IV. 486 b.

Carpenter Work.

Mouldings, IV. 487.

Sawing, XXI. 343, XI. 437; sawyer-work, IV. 476.

Planing, XI. 437; XV. 155.

Hanging doors, IV. 491.

Windows, X. 666, IV. 493; ventilation by, XXIV. 160.

ROOFER'S WORK, IV. 484, and VII. 347.

Roofing.

Slate, XXII. 127; strength of, XXII. 603; slater's work, IV. 500.

Shingles, XXI. 346, and II. 473.

Thatch, IV. 501.

Copper, zinc, and tin roofs, IV. 503.

PLUMBER'S WORK, IV. 502.

Lead, XIV. 374.

Plumbing.

Lead pipes and gutters, IV. 502.

Cesspools, tanks, and water closets, IV. 468.

Gas-fitting, IV. 510.

PLASTERER'S WORK, IV. 504.

PAINTER'S AND DECORATOR'S WORK, IV. 510.

Plastering and Painting.

Mural decoration, XVII. 34.

Stucco work, XVII. 36, and IV. 507.

Paper hangings, IV. 512,

Japanese paper hangings, XIII. 591.

See also Paints or Pigments, XIX. 85.

GLAZIER'S WORK, IV. 509.

Glazing.

Glass, X. 647; window glass, X. 660; plate glass, X. 662.

Putty, XX. 118.

Lead work, IV. 509.

Stained glass, X. 666, 667.

Pavement lights, IV. 509.

Many other articles of practical value to the builder will be suggested to him from time to time, and can be found by reference to the Index volume of the *Britannica.*

Plans.

A series of plans of houses in the American Additions and Revisions, 135 sup., although of more especial interest to architects, will also be of value to many builders.

The article on BUILDING ASSOCIATIONS, IV. 513, and especially that on loan and building associations, 1014 sup., is full of practical information, not only for the builders but for all owners and prospective owners of houses.

For a short list of famous buildings, see page 164 of this volume.

See also the chapters entitled *The Mechanic* and *The Engineer.*

CHAPTER XXV.

THE ELECTRICIAN.

"Every person has two educations, one which he receives from others, and one, more important, which he gives to himself."—*Gibbon.*

THE article on electricity in the eighth volume of the *Britannica*, comprises over one hundred pages —equal in amount of matter to an ordinary 12mo volume of nearly five hundred pages. For the sake of non-scientific readers it is introduced by a brief history of the science, wherein mention is made of some of the more striking electrical discoveries and of the steps by which our knowledge of the subject has advanced to its present condition. In connection with this historical sketch the following notices of men who have contributed to the advancement of the science will be read with interest:

Special Article.

Historical.

Dr. Gilbert (1540–1603), founder of the science, X. 592.
Robert Boyle (1627-91), one of the earliest experimenters.
Otto von Guericke (1602–80), XI. 245.
Sir Isaac Newton (1643–1727), XVII. 438.
Francis Hawksbee (1705), VIII. 4.
Galvani, X. 48.
Benjamin Franklin (1706–90), IX. 711.
Henry Cavendish (1731–1810), V. 271.
Coulomb (1736–1806), VI. 509.
Volta, inventor of the voltaic battery, XXIV. 284.

Ampère, I. 748.

Ohm, XVII. 738.

Michael Faraday, IX. 29.

A supplementary article on electricity, in the American Additions and Revisions, 616–636 sup., gives an outline of the later discoveries in the science. It is profusely illustrated.

Other Articles.

Electrolysis is dealt with in a comprehensive and scientific manner in VIII. 106–114; but this article contains but little that will be of interest to the non-scientific reader. Other articles or sections, generally of a more popular and less technical cast, are the following:

Electrometallurgy, VIII. 114; electroplating, VIII. 116; process of electrotyping, XXIII. 703.

Electro-dynamics, VIII. 105.

Electrometer, VIII. 117–122.

Electroscope, VIII. 118.

Galvanism, X. 48, XVII. 524; the galvanometer, for measuring electric currents, X. 49, VIII. 41.

Magnetism, XV. 219; its relation to electricity, I. 749.

Electromagnetism, VIII. 66: electro-magnetic engines, VIII. 10.

Accumulator, I. 92.

Electric batteries, history of, VIII. 92–94.

Telegraph, XXIII. 112. For invention of telegraph, see Guillaume Amontons, I. 746; S. F. B. Morse, XVI. 847; Sir Charles Wheatstone, XXIV. 537. Submarine telegraphy, 620 sup.; ocean cables, XXII. 281.

The Telegraph.

Telegraphs in United States, 1481 sup.; telegraphic statistics, 1480 sup.

Telephone, 1481 sup. See also XXIII. 127 and the biographical sketches of Alexander Graham Bell, 242 sup., and Thomas A. Edison, 606 sup.

Electric lighting, XIV. 630; for latest developments, see 1007 sup.

Electric motors, XXIII. 496, 508; for latest improvements in, see 622 sup.

Electric Motors.

Electric railways, XX. 249.

Trolley systems for electric motors, 623 sup., and XXIII. 494.

Storage batteries, 627 sup.

Electric clocks, VI. 25.

Electric fan motor, 633 sup.

Electric flash process in photography, 636 sup.

Phonograph, XXIII. 130, 134.

Police and fire alarm systems, 629 sup.

Welding metals by electricity, 632 sup.

Electro therapeutics, 634 sup.

MAGNETISM, XV. 219.

The compass, VI. 225.

Variation of magnetic needle, XV. 220.

Terrestrial magnetism, XVI. 159.

Relation of magnetism to electricity, I. 749.

Magnetic iron ore, XIII. 287.

ELECTRICAL PHENOMENA.—Lightning, XXIII. 330; lightning conductor, XIV. 633.

Natural laws regulating the frequency of thunderstorms, XVI. 128.

The cause of thunder, I. 107.

Franklin's experiment with a kite, VIII. 6.

Connection of lightning with the aurora, III. 92.

Easy experiments to illustrate electrical laws, VIII. 16.

Aurora Borealis, or Northern Lights, III. 90.

Sun-spots and magnetic disturbances, II. 787.

CHAPTER XXVI.

THE MECHANIC.

"Do you suppose when you see men engaged in study that they dislike it? No. There is labor no doubt of a certain kind—mental labor, but it is so associated with interest all along that it is forgotten in the delight it carries in its performance, and no people know that better than the working classes."—*Wm. E. Gladstone.*

WHAT constitutes the difference between the good artisan and the bungler? Knowledge and skill. These may be attained in some degree by practice in the handling of tools; but that broader knowledge which leads to success, and that more perfect skill which wins distinction, can be acquired only through diligent study. The mechanic who would rise to a higher position in his calling, must learn all about the nature of the materials with which he works; he must know what are the best tools to use, and why; he must understand the philosophy of the forces with which he deals; and he must seek to comprehend the natural laws which govern or regulate the operations connected with his particular handicraft. This is the kind of knowledge which enables the humblest workman to develop into the foreman, the manager, the inventor, the skilled artisan.

Artisan or Bungler?

Now there is no other printed publication in the world which offers the means of acquiring so much of this kind of knowledge as does the *Encyclopædia Britannica.* There is hardly a single difficult problem connected with the

laws of mechanics or of machinery which is not clearly explained in the *Britannica*. There is hardly a knotty question with reference to tools, materials, or products which is not elucidated or answered in one of these volumes. The successful mechanic will not always wait for these difficulties to present themselves. He will study the principles of his trade and every detail concerning it, so as to be ready beforehand for all emergencies. Instead of running with childish questions to his foreman, he is ready himself to give instructions to those who are in need of them. His workmanship is of superior character. He is constantly improving, while his fellows who work without thought remain always on the same level. His greater knowledge leads to greater ability. His employer recognizes the greater value of his services. Promotion comes to him as a matter of course. Success and fortune are waiting for him—and all because he has made use of the opportunities for self-culture which lie within the reach of every one who will take the trouble to secure them.

Mechanic's Helper.

In these days there are so many kinds of handicrafts and so many classes of mechanics, that to mark out complete courses of study with relation to all, would require more space than we have at command. But the *Encyclopædia Britannica* contains a vast amount of valuable information concerning every one of them; and it is the object of the GUIDE to help you to get at some of this information in a methodical way, and thereby make you the better able to carry on these studies independently and without aid.

Your first thought, no doubt, will be to turn at once to the article MECHANICS, XV. 676; but it will be better to leave this article until we have made a study of some of the materials and tools with which you propose to work.

In this way we shall gradually approach the difficult *science* of mechanics, and by and by we shall be prepared to read portions of this exhaustive article with a more thorough appreciation than is now possible.

THE WOODWORKER.

Are you a worker in wood? Here are a few articles or parts of articles which you will read with pleasure and profit.

Wood Work.

Lumber, IX. 404.
Strength of materials, XXII. 594.
Bending of plank, XV. 744.
Carpentry, IV. 476.
Joinery, IV. 485.
Fir, IX. 222.
Teak, XXIII. 103.
Hemlock, II. 320.
Spruce, XI. 222.
Oak, XVII. 689.
Pine, XIX. 102.
Poplar, XIX. 510.
Rosewood, XX. 851.
Mahogany, XV. 288.
The early use of tools, VIII. 617.
The plane, XI. 437.
The auger, XI. 438.
Other hand tools, XI. 437.
Machine tools, XV. 152.
Turners' tools, XIV. 324.
The hammer, XI. 425,
The lathe, XIV. 323.
Glue, X. 133 and IV. 489.
Veneering, XXIV. 138 and IX. 489.
Varnish, XXIV. 91.

Wood-carving, XXIV. 644 and V. 168.

American industry in wood working, 1637 sup.

These are mentioned here simply as samples of the numerous articles wherein the wood-working mechanic will find practical information concerning the materials, tools, etc., of his handicraft. If you are a carpenter or builder, turn now to the chapter in this volume entitled *The Builder*, and observe the long and valuable list of references there given.

THE METAL WORKER.

Metal Work.

The metal worker will find that most of the above references are of direct importance to him also, and he will scarcely be willing to omit any of them from his course of reading. Besides these there are numerous others which he will regard as having a special value, referring, as they do, directly to the handicraft in which he is the most deeply interested. Here are a few of them:

Anvil, II. 147, XI. 426.

Smith-work in building, IV. 510.

Annealing, II. 63 and XIII. 352.

Welding—new process, 1396 sup.

Forge, IX. 412; its history, XIII. 290; forging machines, IX. 413.

Foundry, IX. 479; XIII. 355.

Bellows for smelting ores, XVI. 60.

Blast furnace, IX. 840; III. 550.

Iron, XIII. 278.

Iron work in architecture, II. 460; XVI. 71.

Famous iron works: at Barrow-in-Furness, England, III. 395; at Stafford, England, XXII. 442; at Neviansk, Russia, XVII 369.

Rolling mills in America, 1352 sup.

Arms, II, 588; artillery, II. 655; rifles, XI. 282; rifling of cannon, XI. 294. (See chapter in this volume entitled *The Soldier.*)

Assaying, II. 724; XVI. 63.

Boilers for steam engines, XXII. 496; improvement in, for abating smoke, XXII. 181.

Brass, IV. 217.

Bronze, IV. 366.

Copper, VI. 347. (See chapter in this volume entitled *The Miner.*)

Electro-plating, VIII. 116. (See chapter in this volume entitled *The Electrician.*)

Metallurgy, XVI. 57.

Metal work, XVI. 71.

Steel, XIII. 278.

Tube making, IV. 218.

Valves, XXII. 501.

Wire, XXIV. 614; wire drawing, IV. 217.

Work in Leather.

But there are mechanics who work neither in wood nor in metal. Of these, one of the most prominent is the LEATHER-WORKER. For him there are, in the *Britannica*, such articles as the following:

Leather, XIV. 380.

Tanning, XIV. 381.

Tannin, XXIII. 47.

Artificial leather, XIV. 391.

New processes in making leather, 980 sup.

Shoemaking, XXI. 830.

Harness making and saddlery, XXI. 142.

Stamped leather for wall decoration, XVII. 37.

Morocco leather, XIV. 388.

Book-binding, IV. 41; XIV. 538.

Then there is the worker on paper who will find the following articles brimful of information:

Paper, XVIII. 217; manufacture of, XVIII. 219; bleaching of materials, III. 821; ruling, XXII. 461; American manufacture of, 1193 sup.
Wall paper, IV. 512; XVII. 38.
Papier mâché, XVIII. 228.
Paper pulp, 441 sup.

(See the chapter in this volume entitled *The Printer.*)

Associations and unions of mechanics and other workingmen for mutual protection and benefit are variously alluded to in the *Britannica.*

American Workingmen's Organizations, 960 sup.
Trade Unions in the United States, XXIII. 786.
Knights of Labor, 962 sup.
The Grangers, 668 sup. and 774 sup.
Union Labor Party, 1252 sup. and 1522 sup.
Bureaus of Labor, 961 sup.
Trade Unions in England, history of, II. 213.
Unions of Workingmen, XXIII. 499.
Guilds, XI. 259.
Trade Guilds and Wages, XXIV. 310.
Mechanics' Institutes, III. 779.
Progress of the Working Classes, XXIV. 312.
Enfranchisement of the Working Classes, XIX. 352.
Workingmen's International Association, XIII. 189.

Legal relations of workingmen to their employers, XIV. 170.

See the references to labor and wages in the chapter entitled *The Political Economist*, page 239, in this volume.

CHAPTER XXVII.

THE MACHINIST.

"He that loves reading, has everything within his reach."—*William Godwin.*

IN addition to the articles already mentioned in the chapter addressed to the Mechanic, the practical machinist will find a great many others which will be of direct and special aid to him in his calling. He will want to make a careful study of that portion of the article MECHANICS which refers directly to the theory of machines, XV. 752. He will want to read what is said about their purposes and effects, XV. 771. There may be other portions also of the same article which will answer troublesome questions or difficult problems that come in his way, and to find what he needs he should refer to the index to the article, XV. 749. The article on Machine Tools, XV. 152, will have a special value to him; also, he will study such of the following as have any connection with the particular class of machinery in which he is interested, viz.:

Machines.

The STEAM ENGINE, XXII. 473—a very complete and comprehensive treatise (fifty-four pages, illustrated) written by Professor Ewing of Dundee, one of the most eminent of living authorities. Additional matter concerning the invention of the steam engine by Watts may be found in XXIV. 412. The improvements made by Murdock are briefly noted in XVII. 53, and those of Trevithick, in XXIII. 554.

Steam Engine.

Various applications of the steam engine are described: Its use in steamships, XXII. 517, and XXI. 823; its use in locomotive engines, XX. 205, 244, and XXII. 537; its use in land carriages, VIII. 726; its application to farm machinery, I. 305, etc.

The article HYDRO-MECHANICS, XII. 435; the application of water to mechanical purposes as described in the chapter on Hydraulic Machinery, XII. 519.

Hydro-mechanics.

The hydraulic press, XV. 753, and the history of its invention, IV. 213.

The description of Montgolfier's hydraulic ram, IV. 173.

The description of the hydraulic elevator (lift), XII. 520, and XIV. 574.

Of water motors in general, XII. 519.

Of water power in mechanics, XV. 773.

Of water wheels and their action, XII. 438, 522.

Of the uses of air in connection with mechanics, read the article PNEUMATICS, XIX. 240; refer also to XII. 439, 445.

Its special application in air-locks is noticed in 66 sup.; in the air-washer for extinguishing fires, IX. 681; in the pneumatic power-transmitter, XV. 753; in pneumatic tubes, XII. 491; in the air engine, I. 428; in the air-gun, I. 428; in the air-pump, XVI. 30, and XIX. 246.

Pneumatics.

Of the application of gas to the purposes of machinery, see what is said about gas engines, XXII. 523; about the physical properties of gases, XIX. 240; expansion of gases by heat, XI. 574, and XX. 347; elasticity of gases, VII. 801; dilation of gases, III. 35.

Gas.

Then read about the discovery and use of natural gas in the United States, XXIII. 813, and 1111 sup.

For a list of references relating to applications of electricity, see the chapter in this volume entitled *The Electrician* (page 169).

The meaning of the term horse power, and its application in practical mechanics, is explained in XV. 772, 773; and it is still further noticed in XII. 207, and XV. 715. The significance of the term when used in connection with steam engines is made clear in XXII. 476, 491.

Horse Power.

There are still other forces which influence the action of machinery, and of whose manifestations and laws the machinist cannot afford to be ignorant. There is GRAVITATION, for example, the influence of which must always be considered when any system of machinery is contemplated. Study the article on this subject, XI. 66.

Laws of Mechanics.

Then read of the discovery of the general law of gravitation, II. 755; of the various theories in relation to it, III. 64; of gravity in mechanics, XV. 701, 729; and of the discoveries of Archimedes concerning the centre of gravity, II. 380.

Still pursuing this line of study, read of the laws and effects of adhesion, I. 153; of cohesion, V. 56; and of elasticity, VII. 796.

The laws of friction must now claim your attention, and these you will find very fully treated in IX. 777, and XV. 702, 765. The action of friction in connection with liquids is described in XII. 482, and with gases in XVI. 618.

The expenditure of energy in the overcoming of friction is explained in VIII. 208; and the influence of lubricants in preventing friction receives attention in XV. 35.

You are now ready for the article on DYNAMICS, or the science which treats of the action of force; and after that

for the article on Energy, or the power of doing work, VIII. 205. Then read the following:

Dynamics.

Force, VII. 581.
Motion, XV. 752, 676.
Momentum, XV. 677.
Velocity, XV. 681, 769.
Inertia, XV. 676; XV. 748.
Laws of Projectiles, XXII. 47.

If you have followed this course of reading faithfully you have acquired a comprehensive knowledge of those fundamental principles of mechanics which govern the action and modify the effectiveness of all machinery. Much of the reading has been difficult—it has required hard study to master it all. But now you will understand what is meant when it is said that it is the well-informed mind no less than the skilful hand that makes the successful mechanic. Knowledge never impairs one's ability to work, but it adds to that ability. Of course, knowledge cannot supply the place of energy and strength. A good mind must be aided by strong arms; a full memory must have the support of steady industry, or no worthy success can be attained. The best artisan is he who possesses a thorough knowledge of the foundation principles of his calling, while at the same time he has the trained hand and eye and the obedient muscle which can result only from long and patient training and experience.

See now, for further references, the following chapters in this volume:

The Architect, page 161; *The Builder*, page 165; *The Manufacturer*, page 147; *The Electrician*, page 169; *The Inventor*, page 242.

CHAPTER XXVIII.

THE ENGINEER.

"Do as I have done—persevere."—*George Stephenson.*

ENGINEERING—the art of designing and constructing works—embraces a very wide range of subjects, and the different departments into which the profession is divided do not admit of very strict definition. In this chapter it is proposed to indicate a few of the subjects in the *Encyclopædia Britannica* which have relation to the work of the civil engineer. Among these subjects are the different branches of mathematics already mentioned in another chapter (p. 106). To these may be added the articles:

Surveying, XXII. 695, and
Geodesy, X. 163.

Surveying. Both of these, aside from the purely technical and mathematical portions of which they are largely composed, contain much matter of interest and practical value. Of other articles there are many, but it is necessary here to name only a few as examples of the quality of instruction and information to be derived from the *Britannica.*

Bridges, IV. 284–341, is a very comprehensive article, with numerous diagrams and illustrations. A supplementary article on the same subject, 340 sup., contains an alphabetical list of the principal bridges in the world, with descriptive notes of those which are of the most recent construction. Many

Bridges.

of these famous bridges are described in separate articles, of which the following are examples:

Brooklyn bridge, XVII., 465.
Forth bridge, XX. 234.
St. Louis bridge, XXI. 185, etc.
Caissons (used in bridge-building), IV. 647.
River engineering, XX. 571.
River engineering on the Mississippi, XVI. 520.
Embankments, VIII. 158.

Aqueducts, II. 219 (chiefly interesting on account of the history which it contains of ancient aqueducts).

Water-works.

Waterworks, XXIV. 406 (with chapters on reservoir dams, conveyance, purification, storage, and distribution).
Waterworks of London, XIV. 825.
Of Paris, XVIII. 279.
Of New York, XVII. 465.
Of Glasgow, X. 642.

Coffer-dams, VI. 114.

Canals, IV. 782–794 (with diagrams and illustrations).

Canals.

Suez canal, XX. 620.
Panama canal, XVIII. 209.
M. de Lesseps, 989 sup.
Statistics of canals in the United States, 1115 sup.

Harbors.

Harbors, XI. 455–465 (with numerous diagrams). Supplementary article relating specially to the harbors of the United States, 815 sup.

Docks, XI. 465–472.

Roads.

Roads, XX. 582; construction of roads, page, 582; stone pavements, page, 584; wood paving, page 583; asphalt paving, page 586.
Telford road, XXIII. 155.
Macadam, the Scotch road-maker, 1032 sup.

Railways (see chapter entitled *The Railroad Man*, in this volume).

Light-houses.

Lighthouses, XIV. 615; the Eddystone tower, page 615; other famous lighthouses, page 616; modes of construction, page, 617; beacons and buoys, page 625.

Irrigation, XIII, 362; 151 sup.

Sewerage, construction of sewers, XXI. 713.

Sewerage of London, XIV. 826.

Of Paris, XVIII. 280.

Fortification.

Fortifications, IX. 421–468 (a comprehensive treatise, illustrated with numerous diagrams and plates). Especially interesting, even to non-scientific readers, is the history of improvements in permanent fortifications, pages 440–442, and the chapter on the fortification of capitals, page 466. So also is the account of the siege of the citadel of Antwerp, IX. 458, and of the defence of Dantzic, IX. 458.

Other valuable articles are such as relate to:

Miscellaneous.

Societies of Engineers, XXII. 226.

Amalgamated Society of Engineers, XXIII. 50.

Naval Engineers, duties of, XVII. 95.

Royal Engineers in the British Army, II. 579.

Strength of Materials, XXII. 592.

Gunnery, XI. 297.

Artillery, II. 655.

Telegraphy, XI. 632.

Shipbuilding, XXI. 809.

See also the chapters entitled *The Builder* and *The Machinist*, in this volume.

CHAPTER XXIX.

THE FARMER.

"Life in the country is full of practical teachings which richer folk are apt sedulously to deny to their children."—*A Sussex Idyl.*

"Compare the state of that man, such as he would be without books, with what that man may be with books."—*Lord Houghton.*

FARMER A and Farmer B are neighbors. Their lands join, and each has the same number of acres. Twenty years ago, when they entered upon these lands, they seemed to be on an equal footing in every way. It would have puzzled an expert to tell which of the farms had the best soil, or which was the most favorably situated for the purposes of agriculture. Both men were industrious, although everybody said that Farmer B was the harder worker of the two. Yet, from the very start, Farmer A had always the best success. His crops were better, the products of his farm were of a finer quality, he had fewer losses and fewer expenses, and, in short, everything prospered with him. But Farmer B, in spite of all his industry, fell constantly behind. His lands became less and less fertile every year. His crops failed, his stock died, every enterprise seemed to end in disappointment or disaster.

A Common Illustration.

Now, how can we account for the difference in the fortunes of these two men? We cannot explain it by saying that one was born to good luck and the other to misfortune. It is to be explained in this way: Farmer A

spared no pains to acquire a thorough knowledge of his calling. He was a reader of books, and through them he availed himself of the experience of others in every department of agriculture. On the other hand, Farmer B placed his entire dependence in industry alone; and, in the conduct of his business, he had only his own narrow experience to guide him.

The Educated Farmer.

The day of guesswork in farming has passed. In every detail of the farmer's calling, knowledge counts for gain. Other things being equal, the land-worker who keeps abreast of the times has an immense advantage over him who is content to plod along in the footsteps of his ancestors.

To the progressive farmer, the *Encyclopædia Britannica* is a mine of useful knowledge. Containing information of the most thorough and trustworthy kind concerning every department of his business, it proves itself to be a ready helper and adviser on all occasions.

The general article on AGRICULTURE, I. 291–416, is a comprehensive treatise, covering 125 pages, in which every farmer will find much that is both interesting and profitable. Of especial value to American agriculturists is the supplemental article in the American Additions and Revisions, 59–64 sup. To the curious farmer who would like to know how the work of his craft was done in olden times, the chapter on Ancient Husbandry, I. 291–295, will be full of interest. The relative advantages of "Small Farming" and "Large Farming" are discussed in I. 411–412, and XIV. 268. And this introduces us to a highly interesting article on LAND, its ownership, distribution, etc., XIV. 259–271.

Farming in General.

An article on HOMESTEADS, XII. 122, contains com-

plete information concerning the Homestead Law in the United States, and the pre-emption of claims on government lands, XII. 123 b." The farm-seeker who finds it necessary to lease, instead of buying, or otherwise becoming the owner of his farm, will obtain much valuable information from the article on LANDLORD AND TENANT, XIV. 272–278; he will be interested, too, in reading the chapter on Tenure of Land, I. 406 b", and the article on Rent, XX. 402. The land *owner* will also find many things of interest in these articles, and he will want to read still more of the history of land ownership in AGRARIAN LAWS, I. 287 a.

Land Owning.

The chapter on Farm Buildings, I. 308, will save many a farmer much more than the cost of an *Encyclopædia*; that on Fences, I. 309, is also replete with valuable suggestions.. Not many farmers have to build bridges, but such as do will find something of interest to them in 343 sup.. The building of Fruit Houses is described in XII. 223 a", and of Plant Houses in XII. 221 a".

Buildings.

Next to the subject of buildings, that of implements and tools is of importance to every farmer. These are described in detail and at length in the chapter on Machines and Implements of Husbandry, I. 311–328.

Tools.

The successful farmer must also know something about soils. He will find this subject treated in a general way in I. 306; the chemistry of soils is noticed in XIV. 567 b"; the soils best suited for gardens, in XII. 217, 232; while the manner in which different kinds of soils were originally produced is described briefly in X. 265.

Soils.

Closely connected with the latter subject is that of fer-

tilizers. Read what is said of Fertilizers, I. 321; of Manures, I. 342, and XII. 232; of the value of Bone Manure, I. 347, of Lime, I. 350, and of Artificial Manures, I. 353. Then turn to the special and very valuable article on MANURES, XV. 505–512, and to that on Guano, XI. 233.

Fertilizers.

In some parts of the country irrigation is necessary to the production of crops. Farmers in such sections will find it profitable to read the general article on IRRIGATION, XIII. 362, and perhaps also that which is said about irrigation by sewage, XXI. 512. It will also be interesting to read about the curious methods of irrigation practiced in other countries. For instance, the methods pursued in Egypt, VII. 707; in Arabia, II. 244 a; in India, XII. 754; and in Spain, XXII. 299.

Irrigation.

After soils, and the preparation of the ground for crops (see I. 328–340), we come to the crops themselves. A long and valuable article on WHEAT, XXIV. 531, is worthy of every farmer's attention. Indian corn is described under the head of MAIZE, XV. 309. An interesting history of the potato is given in the general article Potato, XIX. 594, while specific directions as to its culture are to be found in XII. 286 a. The diseases of the potato are described in XIX. 596, while the history and nature of the potato-bug are given in VI. 134 a. Passing now to other grains and vegetables, you will find each treated in its appropriate place —for example: Barley, III. 376; Oats, XVII. 696; Flax, IX. 293; Hemp, XI. 647.

Crops.

The special article on COTTON, VI. 482, is interesting and exhaustive. For further information concerning the growth of cotton in the United States, see X. 435 and XXIII. 824. See also the reference to textile fabrics in this volume, page 148.

Growers of rice will turn to XX. 538, and they will also find pleasure in reading how this grain is cultivated in various countries—in India, III. 248, 568; in Japan, XIII. 574: in Java, XIII. 603; and in Madagascar, XV. 172.

The culture of tobacco in the United States receives due attention in XIV. 43, in XXIII. 824, and in XXIV. 260.

Interesting facts concerning the history and nature of the weed are given in the general article on TOBACCO, XXIII. 424.

Statistics. The farmer who cares for statistics relative to the production of FARM PRODUCTS, will find a great deal of trustworthy information in the article on Agriculture, 59 sup., as well as in the chapter on Agriculture in the United States, XXIII. 824–829.

Insects. Has the farmer any enemies? Yes, many of them, and the successful agriculturist will arm himself against them by becoming acquainted with their character and habits. The article on INSECTS AND INSECTICIDES, XIII. 904, will be found to be of great practical value. If you would recognize a friend also, read what is said of the ICHNEUMON FLY, XII. 699. It might be well, too, to read about the TRICHINA, XXIV. 206 and 1507 sup. Vine-growers will find several matters of practical interest in the section relating to the diseases of the vine, XXIV. 238.

Miscellaneous. There is a still further endless variety of topics which will claim the attention of the successful farmer. If he is interested in the production of hay, he will want to read the articles on GRASSES, XI. 53, and 777 sup; if he cares for honey, he will see what is said about BEES, III. 484; if he has more apples than he can eat or sell, he will learn all about

CIDER, V. 775; if he owns chickens or ducks or geese, he will want to know how to make them profitable, and will read the article on POULTRY, XIX. 644. In fact, the number of subjects of this kind is so large that it is impossible here to enumerate them.

Further References.

And now, Mr. Farmer, are you a gardener or a fruit grower? Turn to the next two chapters in this book, and notice the references which are given there. You may not be a stock raiser, in the strictest meaning of the word, but we know that you want to have the best breeds of horses and cattle and swine, and, in the care of them, to avail yourself of the knowledge and experience of others. And so we refer you to the chapter entitled the *Stock Raiser*, page 198 of this volume.

Farming in Other Countries.

Are you interested in what farmers are doing in other countries? Do you want to know what kind of soil they have, what grains they raise, what implements they use? Do you care to learn about their modes of living, or about the profits which they derive from their labor? You will find just such information in the *Britannica*. Look under the head of the country which you have in mind. For example you will find

Agriculture in Austria, III. 119.

Agriculture in Afghanistan, I. 232.

Agriculture in Arabia, II. 244.

And so with almost every country in the world.

Co-operation.

Are you interested in coöperation with others of your calling? Read what is said about FARMERS' ORGANIZATIONS, 668 sup.; about agricultural coöperation, I. 416; about Coöperation in general, VI. 339; and about communities in Europe and America, VI. 218, 219. The chapter on the

Education of Farmers, I. 408, is worthy of attention, and the article on LABOR, XIV. 165, is of no little importance.

Here, then, we have indicated enough reading to occupy your leisure moments for many a day. And as you pursue the study of these subjects, other topics will naturally fall under your eye, and you will see how inexhaustible is the fund of knowledge before you. Can any one now pretend to say that the farmer who has made this knowledge his own, will not be vastly more successful in all the departments of his calling than his neighbor whose information is limited to that which he has acquired through personal experience alone? The *Encyclopædia Britannica* is a farmer's library in itself, covering every division of agricultural lore; and its articles, being the work of specialists, are not only complete and comprehensive, but in the highest degree trustworthy and authoritative.

Conclusion.

CHAPTER XXX.

THE GARDENER.

"He that lives in his own fields and the habitation which God hath given him, enjoys true peace. Nothing should hinder him from the pleasure of books."—*Antonio de Guevara*, 1540.

As a matter of course the gardener's interests are, to a large extent, identical with those of the farmer. Every successful gardener must know a good deal about soils, fertilizers, the preparation of the ground, implements and farm machinery, and many other subjects connected with that larger branch of agriculture generally called farming. And so, Mr. Gardener, if you have come to that storehouse of knowledge, the *Encyclopædia Britannica*, for information which will help you in the practice of your calling, we would advise you to turn to some of the articles which we have just named in the chapter for the guidance of the farmer (see page 185). When you have obtained such information as you wish upon the subjects therein mentioned, you will be all the more ready to profit by the courses of reading and reference which are now to follow.

Gardening in General.

The general article on HORTICULTURE, XII. 211–295, will of course claim your first attention. This is a very comprehensive chapter, and contains as much matter as an ordinary 12mo volume of three hundred and fifty pages. Some portions of the article may be of greater value to you than others. Turn to the Index on page 295 and see what it contains that is of special interest to you.

The chapter on the Formation and Preparation of the

Garden, XII. 217, contains some valuable, practical hints. That on Garden Tools, XII. 233 b; that on Plant Houses, XII. 221 a; and that on the Propagation of Plants, XII. 234 b, will also be found rich in suggestiveness and in direct information.

The Flower Garden.

Is yours a flower garden? Read the chapter on the Flower Garden, XII. 247 a; that on Kinds of Flowers to Cultivate, XII. 248 b; that on Greenhouse Plants, XII. 261 b; the article on GRAFTING, 771 sup.; that on CUTTINGS, 531 sup.; and the chapter on Pruning, XII. 241. The following articles and parts of articles are worthy, as you will at once perceive, of the attention of every florist and of every lover of flowers.

History of the first attempts at the classification of plants, IV. 79 a.

The story of Linnaeus, XIV. 671, and his classification of plants, IV. 79 b.

The account of Robert Brown, the inventor of the natural system of classification, IV. 81 a″, and IV. 385.

The chapter on Structural Elements of Plants, IV. 83.

The special articles on the ROSE, XX. 850, and 1354 sup.

Then there are innumerable special articles on the different kinds of flowers, all of which may be found by reference to the Index volume. Among these articles it may not be amiss to call attention to the following:

Lily, XIV. 643.
Gladiolus, X. 632.
Geranium, X. 439.
Dahlia, VI. 763.
Pansy, XVIII. 214.
Phlox, XVIII. 798.
Honeysuckle, XII. 140.
Hollyhock, XII. 102.

Hyacinth, XII. 419.

Mignonette, XVI. 289.

But it is unnecessary to name more. These are mentioned only as examples of many articles which lovers of flowers will take pleasure in finding and reading.

There are articles on wild-flowers too, such as Ranunculus (buttercup), XX. 272; Violet, XXIV. 241; Daisy, VI. 773; and scores of others. And in the general article on BOTANY, IV. 79, their structure, habits, and growth are treated and described from a scientific standpoint.

Wild Flowers.

If you are interested in Landscape Gardening, see the article on that subject in 967 sup., also the article on LAWNS, 977 sup., and that on the PARKS OF THE WORLD, 1198 sup. Some curious historical facts in relation to the subject may be found by reference to the article Labyrinth, XIV. 180 a". The article ARBORICULTURE will also supply some useful hints; and the account of the Royal Botanical Gardens at Kew, XII. 153, will be found interesting.

Landscape Gardening.

The VEGETABLE GARDEN is described in XII. 278; and the different kinds of vegetables profitable for cultivation are noticed, each in its appropriate place. See what is said about the Potato, XIX. 593, and I. 364, about its diseases, XIX. 596, and about its most destructive enemy, VI. 134. The manner of raising other root crops, such as turnips, mangel-wurzels, carrots, parsnips, cabbages, kohlrabi, etc., is described with some minuteness in the chapter beginning on I. 346. All the common vegetables raised in the gardens receive notice in the *Britannica*, each in a special article under its own name.

The Vegetable Garden.

See also the references in the chapters entitled *The Fruit Grower*, page 195, and *The Woodsman*, page 292.

CHAPTER XXXI.

THE FRUIT GROWER.

"They shall sit every man under his vine and under his fig-tree."—*The Book of Micah.*

"You only, O books, are liberal and independent. You give to all who ask, and enfranchise all who serve you assiduously. Truly, you are the ears filled with most palatable grains—fruitful olives, vines of Engaddi, fig-trees knowing no sterility; burning lamps to be ever held in the hand."—*Richard de Bury.*

FOR the fruit grower, be he farmer or gardener, there is to be found in the *Britannica* a great variety of practical, useful information. As to soils, fertilizers, irrigation, and other subjects of general interest to all cultivators of the ground, it may be well to consult the references already given in our chapter for *The Farmer* (page 185). In the first volume of the *Britannica*, page 284, there is a short chapter on Orchard Culture, which will repay the reading. An extensive list of standard FRUIT TREES, with descriptions of the best varieties, may be found in XII. 269, and should be marked for ready reference. Further descriptions of fruit and fruit trees are presented in special short articles under appropriate headings, for example:

The Orchard.

Apple, II. 211; the culture of apples for cider, V. 775.

Apricot, II. 214.

Peach, XVIII. 442; the peach house, XII. 224; peaches in the United States, 1213 sup.

Pear, XVIII. 445.

Plum, XIX. 230; American varieties, 1246 sup.

Prune, XIX. 230.

Quince, XX. 182.

The article on Strawberries, XXII. 592, is interesting and valuable. So also are those on other small fruits:

Small Fruits.

Raspberries, XIII. 276.

Cranberries, VI. 45, and XII. 270.

Whortleberries, XXIV. 556.

Currants, VI. 715, and XII. 270.

Grapes.

The culture of grapes receives the attention which its importance deserves. See the practical chapter on vineyards, XII. 277; also the special articles on the Vine, XXIV. 237, and 1605 sup. The last named article relates particularly to grape culture in the United States. The manufacture of wine from grapes is described fully in XXIV. 602.

The wines of different localities are referred to elsewhere, as:

Canary wine, IV. 797.

Catawba, V. 219.

Madeira, XV. 178.

Würtemberg, XXIV. 700.

Fruit Houses.

Fruit houses, for the storing of the products of garden and orchard, are described at length in XII. 223. The entire article on HORTICULTURE, XII. 211–295 is of value to the fruit grower, and should be read and frequently consulted.

See also the account of the societies that have been formed for the promotion of horticulture, XXII. 225.

Tropical Fruits.

Tropical fruits are noticed, and described at length. Some of the best known are:

The date palm, VI. 831.

The fig tree, IX. 153; IV. 121.

Banana, III. 307.

Bread Fruit, IV. 241.

Lemon, XIV. 437.
Orange, XVII. 810.
Pine Apple, XIX. 106.
Pomegranate, XIX. 441.

Other articles which commend themselves, not only to fruit growers, but to large numbers of gardeners and farmers as well, are the following:

Care of Trees.
Grafting, XII. 213, 236.
Budding, XII. 237; XX. 423.
Pruning, XII. 214, 241.
Garden Trees, XII. 260.

Insects and Insecticides, 904 sup.
Mildew, XVI. 293.
Diseases of Vines, XXIV. 238.

In the chapter entitled *The Woodsman*, in this volume, the fruit grower may find numerous further references to trees, their culture, propagation, and uses. Many of these, if he will take the pains to consult them, may prove to be of genuine value to him.

CHAPTER XXXII.

THE STOCK RAISER.

"The man who has studied a subject is on that subject the intellectual superior of the man who has not."—*Earl Lytton.*

THE interests of the stock raiser are in many respects identical with those of the farmer. Indeed, most farmers are stock raisers, and most stock raisers are by necessity also farmers. Hence, the references and readings indicated in this chapter are intended for the help and guidance both of farmers and stock raisers, and of all readers of the *Britannica* who are in any way engaged in the breeding or care of domestic animals.

Breeds.

Read the article Breeds and Breeding, IV. 244. Then see what is said of the breeding of animals, I. 389, 393, and XXI. 722.

The article on the HORSE, XII. 172, is a comprehensive one of great value to every horse owner. This is supplemented by some later facts in the American Additions and Revisions, 856 sup., and by further information regarding the breeding and rearing of horses, I. 384.

The Horse.

The statistics of horse raising in the United States are given in 1577 sup.

For the Arabian horse, see II. 240.

For the Persian, XVIII. 625.

For the Clydesdale, XIV. 251.

For the diseases of horses, see XXIV. 201, 204.

The art of horse-shoeing is described in 858 sup., and briefly noticed in XXI. 831 and XVII. 166.

Cattle.

A special article on CATTLE, V. 244, is interesting for its historical information. The chapter on Bovidæ, XV. 432, has a strictly scientific value.

The breeding of cattle is discussed in I. 387.

For the diseases of cattle, see XVII. 57, and XXIV. 204; also I. 304, and V. 589.

The dairyman will read of the management of milch cows, I. 390. He will be especially interested in the long article on the DAIRY, VI. 768; in the articles on Milk, XVI. 301; Butter, IV. 590; and Cheese, V. 455. He will also read what is said of the freshness and purity of milk, 1079 sup., and the directions for its treatment in the dairy, XIV. 304.

The influence of cattle shows, I. 390, is another subject which will claim the cattle-breeder's attention.

Sheep.

The article on SHEEP, XXI. 784, is one of much value to all who have the care of these animals. The breeding and management of sheep are further discussed in I. 391, and IV. 250.

For South Downs, see XXII. 725.

For Merinos, XXII. 300.

For Dorsets, VII. 371.

The diseases of sheep are described in XXIV. 204, and XXIII. 539.

The proper method of shearing is described in I. 396.

And in this connection the very interesting article on WOOL, XXIV. 653, should be read, together with the supplementary article on American manufacturers of wool, 1637 sup.

The American wool-grower will also be interested in what is said of wool-growing in Australia, III. 114. (See

also the references to Textile Products, in this volume, page 148.)

Hogs are treated historically and scientifically in the article on SWINE, XXII. 773, and notes concerning their breeding and management are given in I. 400.

Hogs. Their diseases are described in XXIV. 205, 206, and XVIII. 270.

Poultry is the subject of a valuable article, XIX. 640, wherein the various breeds of fowls are described at length. This is supplemented by an article on FOWLS, IX. 491.

Poultry. The management of poultry receives special attention in I. 401.

Some interesting facts about eggs are given in VII. 201, and VII. 696.

The goose is noticed in a special article, X. 777, and the duck in VII. 505; while the turkey is described at length in XXIII. 657.

Of course the subject of foods and feeding is one in which the stock raiser and farmer are always interested.

The subject of pastures and pasturage is intelligently discussed in I. 370, and I. 402, and is worthy of the careful attention of every stock raiser.

Pasturage. Some account of American grass crops for pasturage is given in 62 sup., and the cultivation of American grasses is the subject of an article in 777 sup.

For the culture of HAY, see I. 378.

The various grains, vegetables, etc., used in feeding domestic animals, have already been referred to in our chapter for *The Farmer*.

Other domestic animals, not mentioned in this chapter, are treated of, each in its proper place. But the care of them cannot properly be said to belong exclusively to the stock raiser or the farmer. See the Index volume.

CHAPTER XXXIII.

THE LAWYER.

"Read, and you will know."—*Sir William Jones.*
"Reason is the life of the law."—*Sir Edward Coke.*

WHO is there who does not need to know something about law? It is, of course, not to be presumed that every man can be his own lawyer, for there are times when the advice and assistance of trained members of the legal profession are indispensable. Nevertheless, there are certain legal terms and processes with which every person ought to be familiar. Questions are constantly arising concerning various matters connected with the operation and enforcement of the laws; and it frequently happens that much depends upon one's ability to answer these questions readily and correctly. You might not deem it worth your while to consult a professional lawyer about such matters, and yet if you should have a book at hand to which you could turn at once for the desired information, you would not remain in ignorance concerning them.

The man who has a law library, however small, has oftentimes no little advantage over the man who has neither the library nor the legal education. The *Encyclopædia Britannica* is itself, within certain limits, an extensive library of legal lore, wherein every important subject connected with this branch of knowledge receives appropriate attention. To the man of business it is better than a law library, because he can refer to it so much more readily. Then, too, its

A Law Library.

articles have none of that redundant verbiage which so often makes the ordinary law-book so tiresome and unsatisfactory. They crystallize the topics. They show the gift of brilliant minds in making principles clear above everything else.

Law Students.

To the young man who is desirous of following the profession of law as the business of his life, these articles are worth many times the entire cost of a set of the *Britannica*. The student who makes himself thoroughly familiar with all these articles in their proper sequence, will know more law than many a graduate from our law colleges. Almost any man of intelligence, by following the courses of reading here indicated, may lay the foundations for a successful legal career.

History of Law.

1. Read the special article on LAW, XIV. 354; which is of itself "as good as a condensed Blackstone." Then read the supplementary chapter on the same, 976 sup.

The origin of law, VIII, 624.
Jewish sacred law, III. 634; XVI. 860.
Laws of Lycurgus, XXII. 370.
Plato on law, XIX. 210.
Roman law, XX. 269.
Roman schools of law, XIV. 164.
Justinian's codification, XIII. 792; VI. 105; XX. 712.
Mohammedan law, XVI, 591, 594.
Salic and other barbarian laws, XXI. 212.
Early English law, VIII. 276.
Inns of court, XIII. 87.
Administration of law in England, VIII. 261.
English codes of law, VI. 104.
Common law, VI. 208.
Constitutional law, VI. 309.
Criminal law, VI. 587; IX. 124.

International law, XIII. 190; X. 161; XII. 152; 911 sup.
Ecclesiastical law, VII. 627.
Canon law, V. 15; XIX. 499; V. 551.
Agrarian laws, I. 287.
Martial law, VI. 517.
Military law, XVI. 295; IV. 587.
Riparian laws, XX. 565.
Sea laws, XXI. 589.
Codes, VI. 104.
Codes of Roman law, XX. 710.
Code Napoléon, IX. 614; XVII. 205,
Laws of the United States, 976 sup.
Jurisprudence, XIV. 354.

2. There are few biographies more entertaining than the lives of the following GREAT LAWGIVERS and eminent men of law:

Biographies.

Moses, XVI. 860; XIII. 397.
Confucius, VI. 258.
Buddha, IV. 424.
Mohammed, XVI. 545.
Zoroaster, XXIV. 822.

Lycurgus, XV. 95.
Solon, XXII. 353.
Justinian, XIII. 792.
Alfred the Great, I. 506.

Savigny, XXI. 326.
Thibaut, XXIII. 300.
Zachariæ, XXIV. 762.
Grotius, XI. 217.
Vico, XXIV. 211.

Sir Edward Coke, VI. 119.
Sir William Blackstone, III. 800.
Sir John Fortescue, IX. 420.
Daniel Webster, XXIV. 417.
Rufus Choate, 455 sup.

3. Among the large number of interesting articles with reference to the practice of law, the following are selected as being especially valuable:

JUDICIAL COURTS, VI. 516.
Areopagus, II. 481.
Courts. Administration of justice in primitive communities, VIII. 624.
Judicial combat, VII. 511; XVII. 820.
English courts of justice, VIII. 261; XX. 311.
Federal courts of the United States, XXIII. 750.
Supreme court of the United States, II. 210; XIII. 789.
Courts of appeal, II. 209; VI. 516; XIII. 765.
Courts of summary jurisdiction, XXII. 641.
High court of justiciary, XII. 790.
Courts of chancery, V. 389; XX. 311.
High court of admiralty, I. 158.
Vice-admiralty courts, I. 160; XXI. 607.
Criminal courts, VI. 516.
Quarter sessions, XX. 159.
Courts of oyer and terminer, XVIII. 106.
Judges, XIII. 762.
Prerogatives of judges, XIX. 673.
Trial by jury, VIII. 298; XIII. 783; XXIII. 555.
Trial by court martial, VI. 517.
Justice of the Peace, XXIII. 789.
Court of Justice of the Peace, XXII. 641.
Judicial costume, VI. 376.
Contempt of court, VI. 318.

Barristers, III. 344.
Attorney, III. 52.
Sheriff, XXI. 800; VI. 513.
Constable, VI. 294.

Laws of agriculture, I. 298.
Laws relating to the tenure of land, XIV. 259; I. 406.
Homestead laws of the United States, XII. 1222.
Landlord and tenant, XIV. 272.
Special Subjects. Leases, I. 341.
Statutes of limitation, XIV. 650.
Laws concerning real estate, XX. 304.
Laws concerning personal estate, XVIII. 664.
Sumptuary laws, XXII. 643.
Liquor laws, XIV. 688.
Laws concerning husband and wife, XII. 400; 874 sup.
Burial acts, IV. 537.
The army act, XVI. 297.
Laws relating to the public health, XX. 96.
Quarantine laws, XX. 153.
Riot laws, XX. 564.
Copyright laws, VI. 356.
Copyright laws of the United States, VI. 365.
International copyright, 506 sup.
Corn laws, VI. 408.
Corn laws in the United States, VI. 413.
Corporation laws, VI. 432.
Municipal laws, VI. 435.
Partnership laws, XVII. 329; 1206 sup.
Patent laws, XVIII. 354.
Passport laws, XVIII. 344.
Passport regulations of the United States, 1207 sup.
Pension laws of the United States, XVIII. 1220.
Factory laws, VIII. 844.

Factory laws in the United States, 659 sup.
Game laws, X. 61.
Laws relating to gambling, X. 66.
Labor and labor laws, XIV. 165.
Silver legislation, 1432 sup.
Laws of apprenticeship, I. 212; 124 sup.
Laws of auctions, III. 68.
Bankrupt laws, III. 341–345.
Capital punishment, 400 sup.
Poor laws, XIII. 462.
Press laws, XIII. 710.
Laws of treason, XXIII. 525–530.
Usury laws, XXIV. 17.
Marriage laws, XV. 565; 1051 sup.
Laws relating to women, XXIV. 637.
Laws regarding infants, XIII. 1.
Law of primogeniture, XIII. 733.
American blue laws, 305 sup.
Brehon law, IV. 252; XIII. 218.
Medical jurisprudence, XV. 778.

4. The following is a partial list of LAW TERMS and legal processes explained in the *Britannica*, and to which it may be necessary at some time to refer.

Law Terms, etc.

Abatement, I. 5.
Abduction, I. 31.
Abettor, I. 48.
Abeyance, I. 48.
Acceptance, I. 82.
Accession, I. 83.
Accessory, I. 83.
Action, I. 132.
Adjudication, I. 154.
Administrator, I. 154.

Adoption, I. 163.
Adulteration, I. 167.
Adultery, I. 177.
Advocate, I. 178.
Advowson, I. 179.
Affidavit, I. 226.
Affinity, I. 226.
Agent, I. 280.
Agistment, I. 283.
Agnates, I. 283.
Alias, I. 574.
Alibi, I. 574.
Alien, I. 574.
Aliment, I. 576.
Alimony, I. 576.
Allodium, I. 576.
Annuities, II. 72.
Appeal, II. 208.
Appraiser, II. 212.
Apprenticeship, II. 212.
Arbitrage, II. 311.
Arbitration, II. 311.
Arraignment, II. 628.
Arrest, II. 629.
Arson, II. 635.
Assault, II. 724.
Assets, II. 729.
Assignment, II. 729.
Assize, II. 729.
Association, II. 730.
Attachment, III. 50.
Attainder, III. 52.
Attorney, III. 62.
Barristers, III. 344.

Blasphemy, III. 805.
Bigamy, III. 668.
Bribery, IV. 278.
Burgage, IV. 532.
Casuistry, V. 203.
Contract, VI. 322.
Costs, VI. 451.
Conveyancing, VI. 324.
Crime, VI. 582.
Codicil, 485 sup.
Conspiracy, VI. 292.
Company, VI. 221, 434.
Contraband, VI. 320.
Damages, VI. 787.
Deodand, VII. 100.
Domicile, VII. 351.
Divorce, VII. 300–305.
Duel, VII. 511; XVII. 820.
Embezzlement, VIII. 159.
Equity, VIII. 510.
Entail, VIII. 450.
Estoppel, VIII. 563.
Evidence, VIII. 738.
Emigration, VIII. 173.
Exchange, VIII. 783.
Executors and administrators, VIII. 800.
Extradition, VIII. 813.
Factors, VIII. 843.
Felony, IX. 68.
Flotsam and Jetsam, IX. 342.
Forgery, IX. 413.
Fraud, IX. 726.
Games and gaming, X. 66.
Gavelkind, X. 119.

Genealogy, X. 142.
Gift, X. 590.
Guilds, XI. 359.
Hiring, XII. 1.
Homestead, XII. 122.
Homicide, XII. 124.
Hotch-Potch, XII. 308.
Impeachment, XII. 717.
Indictment, XII. 842.
Insurance, XIII. 161.
Infant, XIII. 1.
Inheritance, XIII. 77.
Insanity, XIII. 111.
Intestacy, XIII. 197.
Kidnapping, XIV. 69.
Libel and slander, XIV. 505.
Lien, XIV. 569.
License, 996 sup.
Limitation, Statutes of, XIV. 650.
Misdemeanor, XVI. 502.
Monopoly, XVI. 757.
Mortgage, XVI. 848.
Murder, XVII. 52.
Outlaw, XVIII. 75.
Oyer and Terminer, XVIII. 106.
Pardon, XVIII. 271.
Partition, XVIII. 328.
Partnership, 1206 sup.
Patents, XVIII. 354.
Payment, XVIII. 440.
Perjury, XVIII. 548.
Petition, XVIII. 703.
Pension, 1220 sup.
Pleading, XIX. 217.

Penitentiary, XIX. 748.
Poor, XIX. 462.
Prescription, XIX. 704.
Prisons, XIX. 747.
Primogeniture, XIX. 733.
Quarantine, XX. 153.
Quare impedit, XX. 158.
Quo Warranto, XX. 189.
Quorum, 1296 sup.
Receivers, 1315 sup.
Recognizance, XX. 309.
Records, XX. 310.
Registration, XX. 342.
Rent, XX. 402.
Replevin, XX. 404.
Rights, Personal, XX. 555.
Riot, XX. 564.
Sale, XXI. 205.
Sea laws, XXI. 583.
Settlement, XXI. 692.
Simony, XXII. 84.
Smuggling, XXII. 185.
Solicitor, XXII. 251.
Stamp, XXII. 448.
Subpœna, XXII. 642; XXIV. 696.
Succession, XXII. 616.
Summons, XXII. 642.
Sumptuary, XXII, 643.
Surrender, XXII. 692.
Taxation, XXIII. 85; IX. 117.
Theft, XXIII. 231.
Treason, XXIII. 525.
Tort, XXIII. 454; VI. 587.
Trespass, XXIII. 552.

Trial, XXIII. 555.
Trust, XXIII. 595.
Usury, XXIV. 17.
Venue, XXIV. 162.
Wills, XXIV. 570.
Witness, XXIV. 623; VIII. 743.
Wreck, XXIV. 687.
Writ, XXIV. 692.

See also the chapter entitled *The Statesman*, page 234, of this book.

5. TEN BOOKS FOR LAWYERS.

Justinian's Institutes, XIII. 794.
Hunter's Exposition of Roman Law, XIV. 362.
Blackstone's Commentaries on the Laws of England, III. 801.
Littleton on Tenures, XIV. 704.
Coke's Institutes ("Coke upon Littleton"), VI. 120.
Austin's Province of Jurisprudence Determined, XIV. 354.
Sir Henry Maine's Early History of Institutions, XIV. 364.
Hobbes's Leviathan, VIII. 422.
Jeremy Bentham's Rationale of Judicial Evidence, III. 576.
Hallam's Constitutional History of England, XI. 393.

CHAPTER XXXIV.

THE PHYSICIAN.

"Then give place to the physician, for the Lord hath created him: let him not go from thee, for thou hast need of him."—*Ecclesiasticus.*

MEDICINE, the subject-matter of one of the learned professions, includes a wide range of scientific knowledge and skill. In the *Encyclopædia Britannica* it receives a large share of attention, both in its historical and scientific aspects. The special article on this subject, XV. 794–817, gives first a synoptical view of medicine, and then, in the second part, traces its history from its small beginnings in Greece down to the present time. Let us reverse this order, and present first a series of readings or references on

Medicine.

THE HISTORY OF MEDICINE.

Among the ancient Greeks the actual organization of the healing art was ascribed to Æsculapius (or Asclepius), of whom we have a special notice in I. 209. We are now ready to read the section on medicine as portrayed in the Homeric poems, XV. 799, after which we shall take up the following subjects in their order:

Hippocratic medicine, XV. 800.

Hippocrates, "the father of medicine," XI. 852; his surgery, XXII. 674.

Alexandrian school of medicine, XV. 800, and XXII. 674.

Roman medicine, XV. 802; Asclepiades of Prusa, II. 679; Galen, X. 23; Aretæus, II. 485.

Byzantine school of medicine, XV. 804.

Arabian medicine, I. 805, XV. 805; Avicenna, III. 152; Averroes, III. 149; Maimonides, XV. 295.

Medicine in the Middle Ages, XV. 806.

The Period of the Renaissance, XV. 807. See, also, Linacre, XIV. 652; Rabelais, XX. 193; Paracelsus, XVIII. 234, and XXII. 676 (see, in this volume, the references to Alchemy, pages 137, 138).

Revival of ancient medicine, XV. 809.

Great Physicians.

John Kaye, founder of Caius College, IV. 648.

William Harvey, and the discovery of the circulation of the blood, XI. 502.

Van Helmont, XI. 638.

Borelli, and the Iatro-Physical school, IV. 53.

Francis de le Boë, and the Iatro-Chemical school, XV. 810.

Thomas Sydenham, "the English Hippocrates," XXII. 805. He was the intimate friend of John Locke, "the great sensational philosopher," who was also a thoroughly trained physician, and practiced medicine privately, XIV. 751.

Hermann Boerhaave, the organizer of the modern method of clinical instruction, III. 854.

George Ernest Stahl, originator of the theory of "animism," XXII. 444; II. 55.

Morgagni, who was the first to make morbid anatomy a branch of medical research, XVI. 821.

William Cullen, VI. 694.

John Brown, "the last systematizer of medicine"—originator of the Brunonian system—IV. 384.

Hahnemann, founder of the homeopathic school, XI. 373; XV. 814.

Edward Jenner, discoverer of vaccination for small-pox, XIII. 622; XXIV. 23.

Leopold Avenbrugger, inventor of the method of recognizing diseases of the chest by percussion, III. 143, 100.

Laennec, inventor of the method of physical diagnosis, by the stethoscope, XIV. 200.

Erasmus Darwin, VI. 830; XV. 816.

Richard Bright, discoverer of the disease known by his name, 346 sup.

These readings bring the history of medicine down to the year 1878. If further biographical studies are desired, it will not be hard to find, by consulting the Index volume, a great number of sketches of distinguished physicians, such as:

John Abercrombie, I. 36.
John Abernethy, I. 47.
Erik Acharius, I. 94.
Sir J. F. E. Acton, I. 133.
Alexander of Tralles, I. 486.
Prospero Alpini, I. 619.
Charles Alston, I. 638.
Johann Conrad Amman, I. 739.
John Arbuthnot, II. 325.
Neil Arnot, II. 627.
Aspasius, II. 714.
Andrew Combe, VI. 179.
John Elliotson, VIII. 148.

But it is unnecessary for the GUIDE to go farther in this direction. To give a complete list would transcend the limits assigned to this chapter.

SYNOPTICAL VIEW OF MEDICINE.

See the special article on this subject, XV. 794. The following articles may also be consulted as occasion requires:

ANATOMY, I. 799–908. This is a very complete treatise, describing the special anatomy of the human body in a state of health. It is amply illustrated with diagrams and full-page plates.

Anatomy, etc.

PHYSIOLOGY, XIX. 8–43. This valuable article is in two parts—part I., general view; part II., the nervous system.

HYGIENE, XII. 566. This is a short article of a popular character, referring to (1) climatic conditions, (2) site of dwellings, (3) sanitation of dwellings, (4) ventilation, (5) cleansing, (6) water supply, (7) work and exercise, etc.

PATHOLOGY, the doctrine of disease, XVIII. 361–407 (very fully illustrated).

SURGERY, XXII. 672–692. This article embraces (1) the history of surgery, (2) the practice of surgery. In the latter division a detailed and interesting account is given of the recent discoveries and improvements in this art, together with chapters on injuries, processes of repair, surgical treatment of diseases, and operative surgery.

Surgery.

Homœopathy, XII. 126.

Hydropathy, XII. 542; III. 438.

Schizomycetes—the germ theory of disease—XXI. 398–407 (illustrated).

Embryology, VIII. 163.

Miscellaneous Topics.

Anæsthesia, I. 789.
Apoplexy, II. 193.
Bronchitis, IV. 362.
Cholera, V. 682.
Croup, VI. 616; XXIII. 320.
Dentistry, VII. 95.
Dietetics, VII. 200.
Digestive Organs, VII. 221.
Diphtheria, VII. 249.

Drowning, VII. 473.
Fever, IX. 125.
Goitre, X. 739.
Gout, XI. 5.
Heart Diseases, XI. 552.
Hydrophobia, XII. 545.
Hysteria, XII. 600.
Insanity, XIII. 95.
Jaundice, XIII. 598.
Leprosy, XIV. 468.
Longevity, XIV. 857.
Malaria, XV. 316.
Measles, XV. 657.
Neuralgia, XVII. 363.
Nutrition, XVII. 667.
Ophthalmology, XVII. 780.
Paralysis, XVIII. 255.
Parasitism, XVIII. 258.
Pharmacopœia, XVIII. 730.
Phrenology, XVIII. 842.
Phthisis, XVIII. 855.
Plague, XIX. 159.
Pleurisy, XIX. 222.
Pneumonia, XIX. 249.
Poisons, XIX. 275 ; XVIII. 406.
Public Health, XX. 96,
Quarantine, XX. 153.
Quinine, XX. 184.
Rabies, XX. 190.
Scarlet Fever, XXI. 376.
Smallpox, XXII. 162.
Stammering, XXII. 447.
Stomach, Diseases of, XXII. 574.
Sunstroke, XXII. 666.

Throat Diseases, XXIII. 319.
Typhus, Typhoid, and Relapsing Fevers, XXIII. 676.
Vaccination, XXIV. 23.
Vascular System, XXIV. 95.
Vesical Diseases, XXIV. 188.
Veterinary Science, XXIV. 197.
Yellow Fever, XXIV. 734.

The foregoing articles are carefully written treatises on the topics indicated, and each is the work of a leading specialist. Of shorter and less important articles on medical subjects, the number is so great that we cannot undertake to name them here. The mention of a few, as below, will serve to indicate the vast amount of medical lore contained in the *Britannica*.

Diseases, etc.

Abortion, I. 52.
Ague, 65 sup.
Acupressure, I. 133.
Anchylosis, II. 9.
Aneurism, II. 26.
Angina Pectoris, II. 29.
Asphyxia, II. 716.
Asthma, II. 736.
Ataxy, Locomotor, II. 826.
Auscultation, III. 100.
Bright's Disease, IV. 345.
Cancer, IV. 800.
Clubfoot, VI. 42.
Colic, VI. 140.
Corpulence, VI. 435.
Cramp. VI. 572.
Croup, VI. 616.
Diabetes, VII. 147.
Epilepsy, VIII. 479.

Erysipelas, VIII. 531.
Glanders, X. 634.
Paralysis, XVIII. 255.
Peritonitis, 547 sup.
Meningitis, XVI. 11.
Rheumatism, XX. 516.
Rickets, XX. 548.
Whooping cough, XII. 154, etc., etc.

Remedies. Remedies are treated in a like comprehensive manner. Only a few are named, merely as examples:

Arnica, II. 623.
Calomel, IV. 711.
Electro-therapeutics, 634 sup.
Cod liver oil, VI. 104.
Emetics, VIII. 171.
Epsom salts, VIII. 496.
Galbanum, X. 22.
Goa powder, X. 707.
Mercury, XV. 34.
Quinine, XX. 184, etc., etc.

See the references in the chapter entitled *The Chemist and Apothecary*, page 306 of this volume.

CHAPTER XXXV.

THE THEOLOGIAN.

" I preached as never sure to preach again,
And as a dying man to dying men."
—*Richard Baxter*, 1650.

" The altitude of literature and poetry has always been religion—and always will be."—*Walt Whitman.*

Religious Knowledge.

THE *Encyclopædia Britannica*, embracing as it does the whole range of human knowledge, must necessarily devote a large amount of attention to subjects connected with the religious history and religious thought of the world. The number of articles which it contains of this kind, their comprehensiveness, and the breadth of scholarship which they display, are alike amazing. Few private theological libraries contain so much matter of a quality that is so uniformly excellent. To the minister, the pastor, the church official, and the theological student, the *Britannica* offers a fund of information and a wealth of knowledge which can be derived from no other single publication in the English language. It is not the intention in this chapter to locate or point out all the articles which relate to theological or religious subjects—to do so would oblige us to go beyond all the limitations assigned to this volume. It will be sufficient to name a few of the most important subjects, as the reader, when once fairly introduced into

this department of knowledge, will be able readily to refer to others of a similar character.

I. RELIGIONS.

Five Great Religions.

The special article on the religious beliefs and modes of divine worship peculiar to different tribes, nations, and communities, written by Professor C. P. Tiele, of the University of Leyden, XX. 358–370, will be an excellent introduction to this course of study. It may be followed by the reading of such additional articles as these:

1. CHRISTIANITY, V. 688–702. A comprehensive survey of the history and influence of Christianity. By Professor T. M. Lindsay, of Free Church College, Glasgow.

2. JUDAISM. See the two articles, Israel, XIII. 369–431, and JEWS, XIII. 679–687. These articles are chiefly historical, the first by Dr. Julius Wellhausen, of the University of Halle; the second by Israel Davis, of London.

3. BRAHMANISM, IV. 201–211. By Dr. Julius Eggeling, of the University of Edinburgh.

4. BUDDHISM, IV. 424–438. By Dr. T. W. Rhys Davids, of London.

5. MOHAMMEDANISM, XVI. 545–606. A very comprehensive article in three parts:

Part I. Mohammed, by Professor Wellhausen.

Part II. The Eastern Caliphate, by Professor Stanislas Guyard.

Part III. The Koran, by Professor Nöldeke.

Other Beliefs.

Besides the above, there are special articles on all other religious beliefs and systems that have ever exerted any considerable influence upon the thought of mankind. The following articles will be of interest to many readers:

Druidism, VII. 477.

Zoroastrianism, XXIV. 822.

For an account of the religion peculiar to any given country, see the article devoted to that country; for example:

Religion in Mexico, XVI. 211 a.
Religion of Hottentots, XII. 311 b.
Religion in India, XII. 782 a.
Religion in Abyssinia, I. 63.
Religion in Africa, I. 65.
Religion of Gipsies, X. 616, etc., etc.

II. BELIEF IN GOD.

Closely allied in thought to the articles mentioned above, are such as the following:

THEISM, XXIII. 234–249. This embraces a survey of primeval religious ideas, with notices of polytheism, monotheism, trinitarianism, unitarianism, deism, mysticism, agnosticism, etc.

Deism, VII. 33.
Theosophy, XXIII. 278.
Kabbalah, XIII. 810.
Rationalism, XX. 289.
Idolatry, XII. 698.
Fetichism, IX. 118.
See also God, in Index volume, page 184.

III. DOCTRINE, ETC.

Read the special article on THEOLOGY, XXIII. 260–276; also the following:

Christian Doctrine.

Apologetic, II. 189.

Dogmatic, VII. 332–342, "a branch of theological study which treats of the doctrine of Christianity."

Hermeneutics, XI. 741–749, "which treats of Scripture interpretation."

Eschatology, VIII. 534–538, "the doctrine of the last things."

Creeds, VI. 558–565, "authorized formularies of Christian doctrine."

To these longer articles many others of similar import might be added, such as:

Predestination, XIX. 668.
Inspiration, XIII. 154.
Prophet, XIX. 814.
Anthropomorphism, II. 123.
Transubstantiation, VIII. 653.
Antichrist, II. 124.
Christian Apocalyptic, II. 179.
Apostasy, II. 189.
Heresy, XI. 732.
Apostles' creed, II. 194.
Apostolic canons, II. 194.
Canon law, V. 1-23.
Catechism, V. 219.
Litany, XIV. 695.
Thirty-nine articles, II. 653.
Indulgence, XII. 846; 902 sup.
Immaculate conception, XII. 715.
Baptism, III. 348.
Confession, VI. 257.
Confirmation, VI. 258.
Consecration, VI. 291.
Extreme unction, VIII. 813, etc., etc.
See also the references to Church history below.

IV. CHRISTIANITY.

The CHURCH, V. 758.

1. ROMAN CATHOLIC CHURCH, XX. 628–631, by P. L. Connellan, of Rome. See, also, POPEDOM, XIX. 487–510.

This latter article is designed to give the main outlines of the history of the Papacy as an institution. A list of the popes is given at the end; and readers wishing to extend their knowledge of this subject by becoming acquainted with the personal history of the pontiffs, may do so by referring to the special articles in the *Britannica* relating respectively to the different popes. The following articles may also be read:

Christian Sects.

Catholic, V. 227. (For the first use of this name, see V. 9.)

Bishops, III. 788.

Archbishops, II. 369.

Abbot, I. 22.

Acolyte, I. 98.

Celibacy, V. 293.

Propaganda, XIX. 809.

History of Monasticism, I. 14–21, to be read in connection with

Monachism, XVI. 698.

Asceticism, II. 676.

Trappists, XXIII. 522.

Acoemetae (sleepless monks), I. 98.

Old Catholics, XVII. 754.

2. GREEK CHURCH, XI. 154.

3. ARMENIAN CHURCH, II. 548.

4. PROTESTANTISM, XX. 319. Of the sects of Protestanism a very large number are noticed in separate articles in the *Britannica*. The following will indicate the scope and character of these articles:

Adventists, XVI. 320.

Baptists, III. 353; Freewill Baptists, IX, 762.

Catholic Apostolic, V. 237.

Christian Brethren, XIX. 238.

Congregationalists, VI. 268.

Episcopal: Church of England, VIII. 370; Protestant Episcopal Church of the United States, VIII. 493.

Evangelical Association, VIII. 725.

Friends (see Quakers), XX. 147.

Lutherans, XV. 84.

Mennonites, XVI. 11.

Methodists, XVI. 185.

Moravian Brethren, XVI. 811.

Mormons, XVI. 825.

Presbyterians, XIX. 676.

Reformed Church, XX. 339.

Salvation Army, 1376 sup.; 314 sup.

United Brethren, XXIII. 726.

Unitarians, XXIII. 725.

Universalists, XXIII. 831.

To these might be added an extensive list embracing such names as the following:

Antinomians, II. 129.

Aquarians, II. 217.

Annihilationists, 113 sup.

Hussites, XII. 407.

Illuminati, XII. 706.

Independents, XII. 722.

But it is unnecessary to attempt a complete list. The reader who so desires, will now be able to continue the investigation of this subject without further assistance from the GUIDE.

V. CHURCH HISTORY.

As an introduction to another valuable course of reading, take the article entitled CHURCH AND CHURCH HISTORY, V. 758.

The number of special articles, biographical and histor-

ical, relating to the history of the Christian church may be estimated from the following incomplete list of subjects which receive treatment in the first volume alone:

Volume I:—Saint Adalbert, p. 134; Adam of Bremen, p. 138; Adiaphorists, p. 153; Adoptian Controversy, p. 163; Popes Adrian, p. 165; Aetius, p. 356; Archbishop Agelnoth, p. 279; Johannes Agricola, p. 290; Bishop Aidan, p. 424; Alred, p. 475; St. Alban, p. 446; Cardinal Albert, p. 451; Albigenses. p. 454; Bishop Alcock, p. 469; Alcuin, p. 471; Bishop Aldred, p. 475; Cardinal Aleandro, p. 476; Alesius, p. 478; Popes Alexander, p. 486; Joseph Alleine, p. 581; Felix Amat, p. 653; Amalric of Bena, p. 652; Saint Ambrose, p. 662; Nicolaus Arnsdorf, p. 778; Moses Amyrant, p. 782.

Instead of continuing this list so as to cover in the same way the remaining twenty-three volumes of the *Britannica*, the GUIDE deems it sufficent to name merely a few of the most important subjects.

Select List of Topics.

The history of the Christian church may be said to begin with the preaching of St. Peter on the day of Pentecost. See, therefore, St. Peter, XVIII. 693; Pentecost, XVIII. 514; Acts of the Apostles, I. 123.

After these, read:

St. Paul, XVIII. 415.
St. John, XIII. 706.
St Andrew, II. 20
Revelation, XX. 506.
Apollos, II. 189.
Apostolic Fathers, II. 195.
St. Anthony, II. 107.
St. Augustine, III. 75.
Justin Martyr, XIII. 790.
The four St. Gregories, XI. 775–781.
Arius, II. 537.

St. Athanasius, I. 828.
Basil the Great, III. 412.
Chrysostom, V. 755.
Eusebius, VIII. 721.
Irenæus, XIII. 273,
Cyril of Alexandria, VI. 751.
Nestorius, XVII. 355.
Polycarp, XIX. 414.
St. Epiphanius, XVIII. 482.
St. Alban, I. 446.
Sylvester, XXII. 74.
Bede, III. 480.
St. Bridget, IV. 342.
St. Bernard, III. 601.
Crispin and Crispinian, VI. 590.
St. Boniface, IV. 33.
Lanfranc, XIV. 282.
Anselm, II. 91.
Arnold of Brescia, II. 625.
Thomas á Kempis, XIV. 316.
St. Benedict, III. 557.
St. Dominic, VII. 353.
St. Francis, IX. 692; Franciscans, IX. 698.
The Jesuits, XIII. 645.
History of Monasticism, I. 14.
Capuchins, V. 79.
Carthusians, V. 163.
Carmelites, V. 116.
Celestines, V. 291.
Flagellants, IX. 280.
Cloister, VI. 35.
Asceticism, III. 676.
St. Dunstan, VII. 359.
Manichaeism, XVII. 124.

The Albigenses, I. 454.
The Lollards, XIV. 810.
The Waldenses, XXIV. 322.
The Council of Basil, III. 409.
The Inquisition, XIII. 91.
Francis Xavier, XXIV. 716.
John Wycliffe, XXIV. 708.
Zwingli, XXIV. 832.
Erasmus, VIII. 512.
Martin Luther, XV. 71.
John Huss, XII. 404.
John Calvin, IV. 714.
The Huguenots, XII. 337.
The Reformation, XX. 319.
Council of Trent, XXIII. 543.
Thomas Cranmer, VI. 548.
John Knox, XIV. 130.
William Laud, XIV. 346.
Puritanism in England, VIII. 340.
George Fox, IX. 500.
John Bunyan, IV. 526.
John Wesley, XXIV. 504; VIII. 355.
Emanuel Swedenborg, XXII. 758.
William Booth, 314 sup.
Christian Missions, XVI. 511.
King's Daughters, 951 sup.
Epworth League, 648 sup.
Christian Endeavor, 458 sup.
Young Men's Christian Association, 1673 sup.
Woman's Christian Temperance Union, 1634 sup.

VI. FORMS AND CEREMONIES.

Ecclesiastical Costume, VI. 461.
Baptism, III. 348. Ablution, I. 50.

Religious Ceremonials.

Litany, XIV. 695.
Confirmation, VI. 258.
Consecration, VI. 291.
Confession, VI. 258.
Penance, XVIII. 484.
Anointing, II. 90.
Extreme Unction, VIII. 813.
Holy Water, XII. 105.
Eucharist, VIII. 650.
Adoration, I. 164.
Incense, XII. 718.
Rosary, XX. 848.
Breviary, IV. 263.
Missal, XVI. 508.
Absolution, I. 58.
Excommunication, VIII. 798.
Stigmatization, XXII. 548.
Fasting, IX. 44.
Sacrifice, XXI. 132.
Pilgrimage, XIX. 90.
Vows, XXIV. 300.

VII. HOLY DAYS, FEASTS, ETC.

Feasts and Holy Days.

Sunday, XXII. 653.
Christmas, V. 704.
Lent, X. 446.
Palm Sunday, XVIII. 198.
Passion Week, XVIII. 343.
Good Friday, X. 774.
Easter, VII. 613.
All Saints' Day, I. 578.
Atonement Day, VIII. 806.
Candlemas, IV. 808.
Corpus Christi, VI. 436.

Feast of the Annunciation, II. 90.
Feast of the Assumption, II. 734.
Epiphany, VIII. 483.
Candlemas, IV. 804, etc.

VIII. CHURCH GOVERNMENT ETC.

Pope (see Index volume, page 353).
Patriarch, III. 788.
Officers of the Church. Bishop, III. 787.
Presbyter, X. 675.
Clergy, V. 828.
Dean, VII. 13.
Acolyte, I. 98.
Abbe, I. 9.
Abbess, I. 9; Abbot, I. 22.
Abbreviators, I. 29.
Catechumen, V. 220.
Canon, V. 15.
Parson, XVIII. 327.
Vicar, XVIII. 296.
Curate, VI. 709.
Cardinal, V. 96.
Legate, XIV. 412.
Archbishop, III. 369.
Priest, X. 724.
Deacon, VII. 1; Deaconess. VII. 1.
Archdeacon, III. 370.
Almoner, I. 595.
Nun, XVI. 699; Monk, XV . 698.
Neophyte, XVII. 332.

IX. THE BIBLE.

For references to the Bible and Bible history see the chapter entitled *Readings for Bible Students*, page 123.

CHAPTER XXXVI.

THE PUBLIC SPEAKER.

"Mend your speech a little,
Lest it may mar your fortunes."—*Shakespeare.*

HE who would excel as a public speaker must in the first place possess a thorough mastery of words. He must be able to express his thoughts in a manner which is, at the same time, pleasing, forcible, and convincing. He must have a minute and comprehensive knowledge of everything pertaining to the subject which he undertakes to discuss. And he must understand the secret influences and methods by which the minds of his hearers may be moved and their actions determined. A mastery of words and of correct and elegant language may be acquired by the study of rhetoric and its kindred branches (see the chapter entitled *The Writer*, in this volume). A knowledge of the subject to be discussed must be obtained by careful investigation, by personal experience, and by the study of books. One's understanding of the human mind and its motives may be improved by the study of philosophy, and especially that division of the science which is usually called psychology (see the references on pages 120–121, of this volume).

Greek and Roman Oratory.

Very much may be learned by studying the methods of famous orators of former times. Would you know the methods by which Demosthenes made himself the greatest orator of all time, and would you understand something of the distinctive qualities of his oratory? Read the article in the

Britannica, VII. 72. Then read of the characteristics of Greek oratory in general, XI. 142. Read of Antiphon, the most ancient of Greek orators, II. 134 a; of Isæus, XIII. 376; of Hyperides, XII. 596 b; of Lysias, XV. 118; of Isocrates, XIII. 388; and of Andocides, II. 18. Then see what is said about Roman oratory, XX. 719. Read of Cicero, V. 770, and XX. 514; of Hortensius, XII. 210; of Marcus Antonius, II. 140; of Domitius Afer, I. 225; of Julius Cæsar, IV. 633 and XX. 720.

British Oratory.

Then coming down to the oratory of modern times, read of Lord Chatham, V. 440; of Burke, IV. 544; of Fox, IX. 500; of the younger Pitt, XIX. 134; of Grattan, XI. 63; of Brougham, IV. 374; of Lord Derby, VII. 112; of Robert Hall, XI. 392.

American Oratory.

Finally, arriving at the study of our own American orators, read I. 721 b′, and I. 722 b″. Then turn to the article on Patrick Henry, XI. 676; and afterward to those on Fisher Ames, I. 735; Daniel Webster, XXIV. 471; Henry Clay, V. 817; John C. Calhoun, IV. 683; Edward Everett, VIII. 736; and John B. Gough, 768 sup.

Once started in this course of reading, you will be surprised at the large number of additional subjects which will suggest themselves, and if you are actually in earnest you will need no guide to point out their whereabouts in the *Britannica*. You will be able to depend upon and help yourself.

The Temperance Lecturer.

As an example of the manner in which a single subject may be studied with a view to its discussion in public, let us suppose that you are preparing a lecture on temperance. What help can the *Encyclopædia Britannica* give you? Let us see. That the wisest of ancient philosophers advocated temperance, see XXII. 237, and II. 677, and that they de-

clared it to be one of the cardinal virtues, see VIII. 580.

Read of Bacchus, VII. 248 and XVII. 839.

Then, coming to later times, study the valuable article on DRUNKENNESS, VII. 481 ; also Liquor Laws, XIV. 688; License, 996 sup.; Temperance Societies, XXIII. 158.

Other articles and sections which may be read at pleasure are

John B. Gough, 768 sup.
Prohibition Party, 1252 a sup.
Father Mathew Societies, XV. 631.
Abstinence Societies, 26 sup.
Distillation of Spirits, VII. 264 a.
BREWING, IV. 294; Fermentation, XXIV. 602.
Statistics of Brewing in the United States, 339 sup.
BEER, 238 sup.
Brandy, IV. 216.
Whisky, XXIV. 542.
Effects of Whisky, XVIII. 407.
WINE, XXIV. 601 and 1631 sup.
Ale, I. 476.
Absinthe, I. 57.
Arrack, II. 628.
Gin, X. 602.
Liqueurs, XIV. 686.
Perry, XIV. 557.

and in like manner, through the entire list of intoxicating beverages. To these may be added such articles as

DELIRIUM TREMENS, VII. 50.
INSANITY, XIII. 95.
Heredity, VIII. 608 ; XIII. 96, and XI. 837.

The list of books and other publications which advocate the cause of temperance, XXIII. 160, will be found of much value in directing you to further research.

So much for the lecturer on temperance. The political speaker will find a selection of references for his special use in our chapter entitled *The Statesman;* the pulpit orator will find an extensive array of references in the chapter for *The Theologian;* and, generally speaking, the various subjects adapted to public presentation and discussion receive due notice, each under its especial heading. Hence it is unnecessary to multiply examples here.

Other Speakers.

The would-be orator, however, no matter what may be his theme, is recommended to follow out the course of reading suggested in chapter XLI., entitled *The Writer.*

CHAPTER XXXVII.

THE STATESMAN.

"The worth of a State in the long run is the worth of the individuals composing it."—*John Stuart Mill.*

IT is proposed in this chapter to indicate a few of the leading articles in the *Encyclopædia Britannica* which relate to the science of government and which are therefore, of especial interest and value to every citizen who has a voice in the conduct of public affairs, no less than to students, professional politicians, and statesmen. Let us take as the basis of our studies the Constitution of the United States, the full text of which is given in the American Additions and Revisions, page 1533 sup. The amendments are found on page 1537 sup. Read next the article CONSTITUTION AND CONSTITUTIONAL LAW, VI. 309, from which you may derive some idea of the English Constitution and of the points wherein it differs from our own. Then the following articles may be taken up, either independently or in the order in which they are here mentioned:

The Constitution.

1. GOVERNMENT, XI. 9–21. This is a thoughtful and interesting article (1) on the forms of government, (2) on the sphere of government. Under the first division is an account of the three standard forms of government, the monarchy, the aristocracy, and the republic. Then follow chapters on the government of Rome, page 11; on feudalism, page 11; on

Forms of Government.

parliamentary government, page 12; on cabinet government, page 13; on the relation between government and laws, page 14. Under the second division the following topics are discussed: judicature, page 15; state and church, page 16; the *laissez-faire* theory, page 17; education and labor, page 18; federal government, page 20.

Monarchy.

Patriarchal government, XVIII. 410; monarchy, XI. 11; monarchy in ancient Rome, XX. 732; emperor, VIII. 179; empire, VIII. 181; The British Empire, 783 sup.; House of Lords, VIII. 259; House of Commons, VIII. 260; Titles of honor, XXIII. 417; coronation, VI. 429.

Parliament, XVIII. 302; powers and privileges of parliament, page 310; parliamentary procedure, page 311. Act of Parliament, I. 122; regent, 1315 sup.; British Cabinet, IV. 619; budget, IV. 439.

Aristocracy.

Aristocracy—Nobility, XVII. 524; the government of Venice, page 527; the nobility of England, page 529; the Polish aristocracy, page 530; Peerage, XVIII. 458.

Republic, XI. 11; ancient Roman republic, XX. 735; French republic, IX. 597; the republic and socialism, XXII. 221; the world's chief republics, 770 sup.

Political parties in the United States, 1248 sup.; native American parties, 1111 sup.; the Democratic party, XXIII. 755; the Republican party, XXIII. 757; the People's party, 670 sup.; Prohibition party, 1252 sup.

Departments of Republican Government.

President of the United States, 1538 sup.; the successive elections of presidents, 1553 sup. For biographies see articles devoted to the lives of the presidents. Veto, XXIV. 206.

Congress of the United States, 1545 sup.; allotments of representation, 501 sup.; Senate and House

of Representatives, XXIII. 749; Act of Congress, 31 sup.

Supreme Court of the United States, II. 210, XIII. 789; organization of, 1551 sup. See, also, chapter in this volume entitled *The Lawyer*.

Citizenship in the United States, 467 sup.

Naturalization, 1112 sup.

Citizenship.

Allegiance, I. 580.

Ballot, III. 288; Australian ballot system, 193 sup.

Elections, VIII. 2; Election laws in various states, 613 sup.

Treaties, XXIII. 530; reciprocity, 1315 sup.; alliance, I. 585.

State governments, XXII. 458.

Local governments, 1016 sup.; the borough, IV. 62; the town, XXIII. 731; township, 580 sup.

MISCELLANEOUS; The following short list is given merely to indicate a few of the numerous topics of a political character that are discussed in the pages of the *Britannica*:

Political Subjects.

Archons (Greek), II. 476.

Exarch, VIII. 783.

Ephori (Greek), VIII. 469.

Ædiles (Roman), I. 180.

Quæstor (Roman), XX. 145.

Comitia (Roman), VI. 194.

Ambassador, I. 657.

Ministry, XVI. 472.

Consul, V. 315.

Diplomacy, VII. 251.

Exchequer, VIII. 796.

Amnesty, I. 746.

Reconstruction, 1317 sup.

Immigration, 884 sup.
Taxation, XXIII. 85.
National Debts, XII. 889.

A SHORT COURSE OF READINGS IN POLITICAL BIOGRAPHY.

Patriots and Statesmen.

Aristides (500 B. C.), II. 504.
Pericles (450 B. C.), XVIII. 529.
Cato (95 B. C.), V. 240.
Robert the Bruce (14th century), XX. 592.
Oliver Cromwell (17th century), VI. 597.
Andreas Hofer (18th century), XII. 44.
George Washington (18th century), XXIV. 387.
Simon Bolivar, IV. 7.
Giuseppe Garibaldi, XIII. 487.

Sir Thomas More, XVI. 815.
John Hampden, XI. 428.
Algernon Sidney, XVII. 33.
Lord Bolingbroke, IV. 4.
Lord Chatham, V. 440.
Edmund Burke, XVIII. 538.
George Canning, IV. 809.
William Pitt, XIX. 134.
Sir Robert Peel, XVIII. 452.
Lord Palmerston, XVIII. 193.
William E. Gladstone, 758 sup.
Mirabeau, XVI. 492.
Duc de Broglie, IV. 359.
Gambetta, XVIII. 735.
Samuel Adams, I. 143.
Thomas Jefferson, XIII. 613.
De Witt Clinton, VI. 75.
Albert Gallatin, X. 38.
Andrew Jackson, XIII. 533.

Daniel Webster, XXIV. 471.
William Lloyd Garrison, X. 85.
Charles Sumner, XXII. 643.
Jefferson Davis, XXIII. 773.
Abraham Lincoln, XIV. 658.
James A. Garfield, 736 sup.

See, also, the chapters in this volume entitled respectively, *The Public Speaker*, *The Lawyer*, and *The Political Economist*.

CHAPTER XXXVIII.

THE POLITICAL ECONOMIST.

"This is that noble Science of Politics, which is equally removed from the barren theories of utilitarian sophists, and from the petty craft, so often mistaken for statesmanship by minds grown narrow in habits of intrigue, jobbing, and official etiquette—which of all sciences is the most important to the welfare of nations—which, of all sciences, most tends to expand and invigorate the mind—which draws nutriment and ornament from every part of philosophy and literature, and dispenses in return nutriment and ornament to all."—*Macaulay.*

Political Economy.

POLITICAL ECONOMY, in its historical aspects, is the subject of an important article by J. K. Ingram, in the nineteenth volume of the *Encyclopædia Britannica.* The earliest expressions of thought on economic subjects have come down to us from the Oriental theocracies, and of these Mr. Ingram gives an interesting account in XIX. 348. This is followed by a survey of Greek and Roman notions of economics, with quite a full exposition of Plato's ideal system. The economy of the Middle Ages is described at length (pages 353–355), with some notice of the origin of trade corporations, and their influence upon the industrial forces of those early times. The three successive phases of modern economics are then treated with great fulness (pages 352–401). This latter and larger part of Mr. Ingram's article may be read by sections, with collateral references to other articles as follows:

First Modern Phase—Transitional, XIX. 354.

Second Modern Phase—Mercantile, XIX. 354–358; Copernicus, VI. 346; Sir William Temple, XXIII. 171; John Locke, XIV. 751.

Third Modern Phase—Natural Liberty, XIX. 358–401.

1. WEALTH AND CURRENCY. Adam Smith, XXII. 169; his "Wealth of Nations," 364–370.

Wealth in economics, XXIV. 461. Capital, V. 71.

Money, XVI. 720; depreciation of currency, IX. 178; Locke on money, XIV. 754; Ricardo on money, XX. 534. (See references to money in the chapter entitled, *The Banker*.)

Jeremy Bentham, III. 575.

Finance. 2. BANKS AND BANKING. (See chapter entitled *The Banker*.) Savings Banks, XXI. 327. Bonamy Price, 1269 sup.

3. POPULATION. Population considered in its statical and dynamical aspects, XIX. 513.

Population. The Malthusian theory, 371; Thomas Malthus, XV. 343.

4. TAXATION. See the special article on taxation, XXIII. 85. Ricardo, XX. 533; taxation and protection, IX. 755.

Henry George, 742 sup.

5. PAUPERISM. See POOR LAWS, XIX. 462.

Robert Owen, XVIII. 86.

American Almshouses, 85 sup.

6. LABOR AND WAGES. Special article on Labor, XIV. 165.

Lassalle, XIV. 321.

Special article on Wages, XXIV. 307.

American organizations, 960, 961 sup.

American Working Girls' Society, 1640 sup.

Apprenticeship, I. 213.

Guilds, XI. 259.

7. CO-OPERATION. Communism, VI. 211; Socialism, XXII. 205; Co-operation, V. 338.
Oneida Community, XVII. 773.
Shakers, XXI. 736.
Fourier, IX. 489.
Saint-Simon, XXI. 197.
Robert Owen, XVIII. 86.
Plato's Republic, VI. 212.
Sociological conceptions of Comté, VI. 235.
Mutual Aid Societies, 1443 sup.
Building and Loan Associations, 1014 sup.
Modern Clubs, VI. 41.
Anti-Poverty Society, 117 sup.

8. TARIFF. See the special article, Free Trade and Protection, IX. 752. Supplementary article, 721 sup.; Bastiat, III. 428; Henry Fawcett, 671 sup.

9. POLITICAL ECONOMISTS. A few famous economists not named above:
John Stuart Mill, XVI. 307.
J. E. Cairnes, IV. 643.
Walter Bagehot, XIX. 396.
Arnold Toynbee, XIX. 397.
Benjamin Franklin, IX. 711.
Harriet Martineau, XV. 583.
Nassau Senior, XXI. 663.

For further references, see the chapter entitled *The Statesman.*

CHAPTER XXXIX.

THE INVENTOR.

"Neither the naked hand nor the understanding, left to itself, can do much; the work is accomplished by instruments and helps, of which the need is not less for the understanding than the hand."—*Bacon.*

THERE are few persons who have more to gain from self-culture than those who aspire to success as inventors.

Knowledge *vs.* Guesswork.

It is true that now and then some wonderful discovery has been stumbled upon by accident. But almost every invention that has been of any genuine importance to the world has been the result of long and patient study and unwearying toil. No amount of guesswork will produce a new machine possessing the qualities of novelty and utility requisite to a sucessful invention. The man who would bring such a machine into existence, must devote his days to the acquisition of a thorough knowledge of the philosophical principles underlying its construction. He will need to understand the laws of mechanics; he must be able to perform certain necessary mathematical processes; and he must have an insight into the theory of machinery. One inventor will probably find it necessary to study the laws of hydrostatics; another will need to have a complete knowledge of chemistry, or of mineralogy, or of botany; still another will add to all these branches of knowledge an understanding of the science of optics, or acoustics, or it may be of meteorology, or of astronomy, or of navigation.

Then, again, every inventor will find it worth while to learn what has been done by other inventors who have come before him. Turn to the chronological table on page 720, volume V., of the *Encyclopædia Britannica*, and notice the dates when the great inventions and discoveries which have revolutionized the world first made their appearance. Read next the HISTORY OF PATENTS in XVIII. 304, and notice the patent laws which are now in force in all the principal countries. It will then be an interesting exercise to read the biographies of the famous inventors of various times and countries. You might begin with the legendary story of Dædalus, the first great inventor, VII. 760. Then take up subjects like the following:

Patents.

Roger Bacon, the first English scientist and inventor, III. 218; his magical inventions, XV. 208; his theory of optical glasses, XXIII. 135.

Sir Humphrey Davy, inventor of the safety lamp, VI. 845; the Davy lamp, VI. 72.

Great Inventors.

Denis Papin, inventor of the heat engine, XVIII. 228, and XXII. 474; his improvements on the air pump, XIX. 246.

James Watt, inventor of the steam engine, XXIV. 412.

Robert Fulton, inventor of the steamboat, III. 542.

Oliver Evans, improver of the steam engine, VIII. 726, and XXII. 475.

Benjamin Franklin, the first American scientist, IX. 711; his electrical researches, VIII. 6.

Eli Whitney, inventor of the cotton gin, XXIV, 1627.

Samuel F. B. Morse, inventor of the telegraph, XVI. 847.

Sir Richard Arkwright, inventor of the spinning frame, II. 540, VI. 490.

James Hargreaves, inventor of the spinning jenny, VI. 490, XVII. 600.

Samuel Crompton, inventor of the spinning mule, IV. 597.

Samuel Colt, inventor of improved fire-arms, VI. 166.

Richard J. Gatling, inventor of the Gatling gun, 739 sup.

Henri de Girard, inventor of flax-spinning aparatus, X. 620.

Sir William Siemens, inventor of the gas engine, XXII. 37, 526.

Elias Howe, inventor of the sewing machine, XXI. 718.

Cyrus H. McCormick, inventor of the reaping machine, 1036 sup.

Thomas A. Edison, inventor of many electrical machines and appliances, 606 sup.

Alexander Graham Bell, inventor of the telephone, 242 sup.

These are only a few of the numerous inventors and discoverers whose biographies are to be found in the *Encyclopædia Britannica*. Now as to some of the most FAMOUS INVENTIONS, notice the following:

Great Inventions.

Gunpowder, II. 655; XI. 316; VIII. 807; first use of gunpowder, II. 655.

Fire-arms, history of, II. 655; ancient guns, II. 557; gun-making, XI. 278; gunnery, XI. 297; rifle, XI. 282; musket, II. 558; naval cannon, XVII. 286.

Printing presses, 1271 sup.; type-setting machines, 1272 sup.; XXIII. 700; typewriters, 1516 sup.; XXIV. 698.

Air-ships. See the article Aëronautics I. 185, and the supplementary article on the same subject, 39 sup. Read of flying machines in the article Flight, IX. 317; and of balloons in III. 549, and I. 187.

Air engines, I. 428.

Bells, 245 sup.

Brakes, IV. 211; railway brake, XX. 248.

Buttons, IV. 598.
Brushes and brooms, IV. 403.
Calico-printing machines, IV. 685.
Candle-making, history of, IV. 802.
Carriages, history of, V. 134.
Clocks, VI. 13; electrical clocks, VI. 25.
Coloring machines, IV. 691.
Combs, VI. 177.
Cutlery, VI. 733.
Diving bells, VII. 294–300.
Elevators (lifts), XIV. 573.
Fire-extinguishing apparatus, IX. 235, and 680 sup.
Friction matches, invention and history of, XV. 624.
Furniture, IX. 847.
Locks, XIV. 744.
Lithography, XIV. 697; photo-lithography, XVIII. 833, and 1234 sup.
Microscope, invention of, XVI. 258.
Mirrors, XVI. 499; magic mirrors, XVI. 501.
Pens, XVIII. 483, and 1215 sup.
Pencils, XVIII. 489.
Phonograph, invention of XXIII. 130, 134.
Photography, XVIII. 821; Daguerre's invention of, VI. 761; Niepce's inventions, XVII. 495; electric flash process, VIII. 636; recent progress in, 1230 sup.
Photogravures, invention of process, 1235 sup.
Reaping machines, I. 322.
Rings, history of XX. 560.
Rope-making, XX. 843.
Sewing-machines, XXI. 718.
Safety lamp, VI. 487, VI. 72, and XVI. 461.
Spectacles, XXII. 372, and XVI. 258.
Steam engine, invention of, XXIV. 412; description of, XXII. 473.

Steamships, invention of, III. 542, IX. 270, and XXII. 478; description of, XXI. 823.

Stereoscopes, XXII. 537.

Stocking frame, XII. 299.

Telegraph, history of, XXIII. 112.

Telephone, history of, XXIII. 127; description of, 130.

Telescope, history of, XXIII. 135–139; description of, 139–154,

Twine-making, XX. 845.

Watch-making, XXIV. 394.

Weaving, XXIV. 463; ancient looms, XXIII. 206; spinning jenny, II. 541, and VI. 490.

This list might be continued to a very great length, but enough has been given to indicate the very complete and comprehensive manner in which the subject of inventions is treated in the *Britannica*.

Special Subjects.

Now, there are certain special subjects with which almost every inventor needs to have some acquaintance. One man will want to know all about the most recent discoveries in electricity —for he is seeking to invent some new electrical appliance, or to make some improvement on former patents. He should consult the references mentioned in the chapter entitled, *The Electrician*, page 169 of this volume. Another inventor will find it necessary to investigate the phenomena and laws of HEAT. Here are some references that may be helpful to him:

Heat.

Special article on Heat, XI. 554.

Theory of the action of heat, XIX. 2.

Heat as energy, VIII. 207.

Latent law of heat, VIII. 731.

Diffusion of heat, VII, 207.

Conduction of heat, XX. 212.

Convection of heat, XX. 212.

Power of heat in mechanics, XV. 773.
Production of heat by different fuels, IX. 807.
Heat of coal compared with that of oil, XVIII. 240.
Mechanical equivalent of heat, VIII. 209.
Transformation of heat into force, XXIII. 283.

Mechanical Laws.

A third inventor will want to understand the theory and construction of MACHINES, and perhaps also the general laws of mechanics. Let such an one consult the references named in the chapter entitled *The Mechanic*, page 172 of this volume. A fourth inventor is interested in such subjects as the air, gases, etc. He will find the *Britannica* full of information of just the sort that he is seeking. For example, in I. 427, there is a brief article on air, with references to

Atmosphere, III. 28.
Meteorology, XVI. 114.
Barometer, III. 381.
Pneumatics, XIX. 240.
Ventilation, XXIV. 157.

This is followed by an interesting account of the air-engine, I. 428, and this by an article describing the air-pump, I. 429. Then, by turning to the Index volume, one may find scores of minor references to various items of information relating to this particular subject.

In short, there is no subject connected with the invention of machines, or of useful appliances of any kind, that does not receive somewhere in the *Britannica* the concise and comprehensive treatment which its importance demands.

See the following chapters in this book: *The Engineer*, *The Architect*, *The Builder*, *The Manufacturer*, *The Railroad Man*, *The Farmer*, *The Printer*, *The Miner*.

CHAPTER XL.

THE TEACHER.

"The true university of our day is a collection of books."
—*Thomas Carlyle.*

VALUABLE as the *Encyclopædia Britannica* is to persons of all callings and professions, there is no one who can derive greater benefit from it than the teacher. To the man or woman actively engaged in education, its worth is beyond all estimation. It is an exhaustless mine of knowledge, offering information on every imaginable subject. It is an obliging friend, answering the thousands of perplexing questions that are daily and unexpectedly presented, and never making a mistake. It is the teacher's *vade mecum*, the indispensable companion to which he turns for help and guidance in every time of need. If one were asked to point out the articles of greatest value to the educator, he could not answer—he could only say, "All are valuable." To the teacher of sciences, the articles on scientific subjects will be referred to most frequently (see the references on pages 89–98 of this volume). The teacher of mathematics will derive aid from the numerous chapters and treatises on mathematical subjects (see page 106). And so, whether you are a teacher of geography, or of philosophy, or of literature, or of history, or of music, or of art, or of any other department of human knowledge, you will find the *Britannica* always ready to supplement your in-

The Teachers' Book.

struction and to aid you in the work which you have in hand.

This is the day of educated teachers—of teachers who are learned not only in the branches which they teach at school, but in the principles which underlie the practice of their calling. Pedagogy has become a distinct science. School teaching is no longer a haphazard business, but it is a profession conducted on lines as exact as those which determine the practice of law or of medicine or of theology. The teacher who neglects or refuses to recognize this fact is already on the road to failure and his successor is knocking at the door.

Pedagogy.

In the present chapter it is proposed to mark out two or three brief courses of professional reading for teachers—courses which may be pursued at odd moments at home and which will in no small measure take the place of similar courses of study in teachers' institutes and normal colleges. The teacher who follows them out faithfully will not only be better equipped for examinations, but will be possessed of a broader and deeper knowledge of his profession and consequently much better prepared to grapple with its difficulties and avoid its perplexities.

I. HISTORY OF EDUCATION.

Let us take as the starting point and basis of this course of reading the article EDUCATION in the seventh volume of the *Britannica*. This article which covers ten double-column pages (671–681) is the work of Oscar Browning, of Cambridge University, well known in this country for his work on Educational Theories. The object of the article is mainly to outline the history of educational theories in the chief crises of their development, and no attempt is made to discuss the science of teaching

or to describe the practical working of any particular method or theory. Let us then study the history of education from the following references:

Education in Greece and Rome.

Old Greek education, VII. 671.
Plato, XIX. 194.
Old Roman education, VII. 671.
Quintilian, XX. 187, 514.

Early Christian education, VII. 671.
Clement, V. 819.
Origen, XVII. 839.
Tertullian, XXIII. 196.
Augustine, III. 75.
Education in the Middle Ages, VII. 671.
See also Knighthood, XIV. 110.

The Middle Ages.

Charlemagne, V. 402.
Alcuin, I. 472.
Bede, III. 480.
John Scotus Erigena, VIII. 522.

Gerhard Groot, XI. 207.
Thomas á Kempis, XIV. 31.
Brethren of the Common Life, XVI. 711.
Education at the time of the Renaissance, VII. 672.
See also Erasmus, VIII. 512.
Luther, XV. 71.
Melanchthon, XV. 833.

Twelve famous teachers:
Sturm (1507–89), XVII. 673.
Roger Ascham (1515–78), II. 677.

Famous Teachers.

Comenius (1592–1671), VI. 182.
Ignatius Loyola, XV. 31.
Arnauld, II. 620.
Pascal, XVIII. 333.

August Hermann Francke, IX. 701.

Pestalozzi, VII. 677.
Froebel, IX. 792.
Jacotot, XIII. 539.
Thomas Arnold, II. 626.
Horace Mann, XV. 492.

Writers on education:
Roger Ascham ("The Scholemaster"), II. 677.
Montaigne, XVI. 767; VII. 674.
Books and Writers. John Locke, XIV. 751.
John Milton ("Tractate on Education"), XVI. 324.
The Port Royalists, IX. 661.
Rousseau ("Emile"), XXI. 26.
Pestalozzi ("Leonard and Gertrude"), VII. 677.
Jean Paul Richter ("Levana"), XX. 546.
Goethe ("Wilhelm Meister"), X. 732.
Herbert Spencer, 1455 sup.
Alexander Bain, 188 sup.

II. PSYCHOLOGY.

The article on PSYCHOLOGY, by Professor James Ward of Trinity College, Cambridge, (Volume XX.) fills nearly fifty pages of the *Britannica*, and contains more matter than the ordinary school text-books on this subject. The teacher who cares to go so deeply into the study as to master this entire treatise, will probably not desire a more extended course of reading. It may be preferable, however, to read only selected portions of the article and to supplement the knowledge thus gained with collateral readings from other sources. In such case the following subjects may be included: Definition, page 37; standpoint of psychology, page 38; constituent elements of mind, page 39;

Science of Mind.

feeling, page 40; attention, page 41; dependence of action on feeling, page 43; relativity, page 49; sensation and movement, page 50; perception, page 52; intuition of things, page 55; imagination or ideation, page 57; obliviscence, page 61; expectation, page 63; feeling, page 66; intellection, page 75, etc.

Evolution of mind, VIII. 70.
Mental association, II. 730.
Mental powers of man, II. 109.
Attention, III. 52.
Relativity of knowledge, I. 58.
Sense distinguished from understanding, VIII. 1.
Locke on this subject, XIV. 758.
Faculties of perception, XVIII. 845.
Kant on imagination, XIII. 852.
Memory—mnemonics, XVI. 532.
Optimism and pessimism, XVIII. 684.

The following biographical notes should also be read:

Great Psychologists.

Aristotle, II. 522.
Xenocrates, XXIV. 719.
Democritus, VII. 59.
Plato, XIX. 201.
Thomas Brown, IV. 388.
Bishop Berkeley, III. 589.
Pierre Charron, V. 431.
Etienne de Condillac, VI. 251.
Victor Cousin, VI. 525.
Descartes, VII. 126.
Kant, XII. 848.
Leibnitz, XIV. 422.
Herman Lotze, XV. 14.
Schleiermacher, XXI. 411.
Schopenhauer, XXI. 457.

Hegel, XI. 620.
Herbart, XI. 719.
Samuel Bailey, III. 242.
Hume, XII. 352.
G. H. Lewes, XIV. 491.

III. MISCELLANEOUS.

Plato's Academy, I. 68.
Other famous academies, I. 69.
The Athenæum, II. 831.
Universities, XXIII. 831. (This extensive article exhibits the universities in their historical development, each being brought under notice, as far as practicable, in the order of its original foundation.)

Universities and Colleges.

Oxford University, III. 317, XXIII. 837.
Cambridge University, III. 579, IV. 728, XXIII. 838.
Edinburgh University, XXIII. 846.
University of Leipsic, XIV. 429, XXIII. 841.
American Universities, XXIII. 857.
Harvard University, XI. 500.
Harvard Annex, 755 sup.
Yale University, XVII. 394.
Columbia College, XVII. 456.
Provisions for secondary education in America, 606 sup.
Scientific and other academies, I. 70.
Institute of France, XIII. 160.
Scientific and other societies, XXII. 221.
Societies for the promotion of education, XXII. 226.
Guilds, XI. 259.
Reformatory and Industrial schools, XX. 338.
Physical education—Gymnastics, XI. 348.
Technical education, XI. 105.

Kindergartens, XIV. 79; see, also, Froebel, IX. 792.
Examinations, VIII. 777.

IV. THEORIES OF EDUCATION.

Plato's, VII. 671,
Socrates's, XXII. 236.
Quintilian's, VII. 671.
Theories of Education. Brethren of the Common Life, XI. 207.
Theories of Erasmus, VII. 672, VIII. 512.
Theories of Sturm, VII. 673.
Theories of Comenius, VI. 182, VII. 673.
The Jesuits', XIII. 645.
The Port Royalists', XIX. 533.
Rousseaus', VII, 675.
Pestalozzi's, XIV. 79; XXII. 798.
Froebel's, IX. 792.
Herbart's, XI. 798.
Locke's, XIV. 757.
Milton's, XVI. 330.

V. EDUCATION IN DIFFERENT COUNTRIES.

United States, XXIII. 828.
France, IX. 512.
Germany, X. 470.
At Home and Abroad. Italy, XIII. 460.
Russia, XXI. 71.
Austria, III. 118.
Iceland, XII. 619.
India, XII. 774.
Arabia, II. 253.

Generally a full account of the educational institutions of any country may be found in the article referring to the country in question.

CHAPTER XLI.

THE WRITER.

"Certainly, the art of writing is the most miraculous of all things man has devised."—*Thomas Carlyle.*

"There are two duties incumbent upon any man who enters on the business of writing: Truth to fact, and a good spirit in the treatment."—*Robert Louis Stevenson.*

FIRST, as to the manual exercise of penmanship, what is there in the *Britannica* which commends itself to the writer, or to him who is interested in the art of writing? Let us see.

Without implements and materials there can be no writing. The history of these and the description of their manufacture cannot fail to be of interest.

Writing Materials. Read the article PEN, XVIII. 483; then INK, XIII. 79; then an account of the invention of paper, IV. 38, of its invention by the Chinese, V. 662, of the uses made of it in ancient times, XVIII. 144, and finally the special article PAPER, XVIII. 217. Read also of the Papyrus, XVIII. 231, and of Parchment, XVIII. 271, XIV. 390, and IV. 37. The earliest writing materials are described in XVIII. 231 b.

Hand-writing. The history of ancient handwriting is related in a very comprehensive article on PALÆOGRAPHY, XVIII. 143–165; the ancient system of Hieroglyphics, XI. 794; cuneiform writing, VI. 707, and XI. 217; Mexican picture writing, XVI. 212; stenography, or shorthand, XXI. 836.

A comprehensive history and description of Alphabets is given in I. 600.

The alphabets of different nations also receive separate notice. For example:

The Phœnician, XI. 807, and XVIII. 802, 806; Egyptian, XI. 807; Greek, XI. 597; Roman, XIII. 125; Sanskrit, XXI. 270; the old Norse Runes, XXI. 366, 370.

The deaf and dumb alphabet is described in VII. 8; the phonetic method in XVIII. 812, and XXII. 39; and the phonographic in XXI. 836.

Composition.

The mental processes of writing are closely related to the various branches of language study, such as grammar, rhetoric, prosody, etc. Hence, the inquiry may be made, "What are the principal articles in the *Britannica* which will be interesting and useful to the busy man who wishes to acquire correctness and facility in English composition?" Let us briefly notice a few.

Rhetoric.

The special article RHETORIC, XX. 509, is interesting and comprehensive, and in large part historical. Notice the section on rhetoric in ancient Greece, XX. 509; that on rhetoric in the Middle Ages, XX. 515; and that on modern writers on rhetoric, XX. 515.

Still pursuing the history of this subject, read the notice of Aristotle's rhetoric, II. 517; of Lysias's, XV. 118; and of Quintilian's, XX. 187. Read also the brief account of Whately's famous work, XXIV. 530.

Being fairly introduced into this study, you are now prepared to consult the *Britannica* for the large number of separate articles relating to the terms, expressions, and rules of rhetoric and its kindred branches of study. Here are some that are found in the first two volumes; they are

mentioned simply as examples, trusting that the reader will be able to find all other articles of the kind without further directions:

In Volume I. Acrostic, Alcaics, Allegory, Alliteration, Alexandrine Verse, Anacoluthon, Anachronism, Anagram, Abbreviations, etc.

In Volume II. Anecdote, Anticlimax, Antithesis, Autonomasia, Aphorism, Apologue, Apophthegm, etc.

By observing the list of terms and expressions used in any text-book in rhetoric you may complete this list; and then by finding the various articles in the *Britannica* you will observe how much more fully they are treated there than in any of the smaller manuals.

Grammar.

The article GRAMMAR, XI. 37, belongs rather to the philologist than to the writer, and more to the student than to the busy man. The section on school grammars, XI. 43 a, is interesting, and well worth your reading.

But, after all, it is chiefly through the study of the works of the best writers that one can hope properly to improve his own style, and to acquire facility and elegance in the use of language. Hence the busy writer is urged to make a special study of the references in the chapter on *Literature* in this volume, page 64; also the chapter entitled *The Public Speaker*, page 230.

ONE HUNDRED SUBJECTS FOR ESSAYS.

The following list is designed chiefly to aid teachers and pupils at school in the selection of subjects for essays, some of the materials for which may be acquired through the systematic study of certain articles in the *Encyclopædia Britannica*. A good rule, which every writer should attempt to observe, is this: "Never undertake to write upon any topic until you have made a careful study

of that topic. Store your mind with knowledge, so that your writing will be the visible expression of your thoughts. Always have something to say before you attempt to speak." The various references mentioned or pointed out will indicate some of the places in the *Britannica* where information regarding those subjects may be found. But they are intended only as hints, and are not designed to relieve the student from the very necessary labor of independent research.

1. Temperance. See the references given in chapter entitled *The Public Speaker*, page 230.

2. The Wonders of Electricity. See VIII. 3; XV. 773; XX. 249; also 616 sup. The references in the chapter for *The Electrician*, in this volume will be helpful.

3. Ancient Oratory. See the references to famous speakers, in the chapter entitled *The Public Speaker*.

4. American Poetry. Study the article on American literature, I. 731–734. Read also the biographical sketches of the great American poets: Henry W. Longfellow, XIV. 680; John G. Whittier, 1627 sup.; William Cullen Bryant, 358 sup.; Ralph Waldo Emerson, 644 sup.; James Russell Lowell, 1027 sup.; Edgar Allan Poe, XIX. 255; Walt Whitman, 1627 sup.

5. True Greatness in Man. See biographical sketches of such men as Joseph, XIII. 749; Moses, XVI. 860; Confucius, VI. 258; Buddha, III. 375; Elijah, VIII. 134; Socrates, XXII. 231; Cato, V. 239; Charlemagne, V. 402; King Alfred, I. 506; St. Louis, XV. 18; Savonarola, XXI. 333; Galileo, X. 30; John Milton, XVI. 324; George Washington, XXIV. 387; and many others.

6. The Earth. See references in the *Courses of Reading in Geography*, page 101.

7. Mountains. Refer to special article, XVII. 4; also to references on page 103 of this volume.

8. The Ocean. Water of, XXI. 611; waves, XXIV. 419; depths, III. 17; temperature, VI. 4; tides, XXIII. 353; fishes, XII. 684.

9. Great Cities of the World. See London, XIV. 818; Paris, XVIII. 274; New York, XVII. 457; Berlin, III. 598; and others that will readily be suggested. Consult the Index volume. Population of the world's chief cities, 1256 sup.; of the cities of America, 465 sup., and 571 sup.

10. Ships and Sailors. See chapter in this volume entitled *The Seaman.*

11. Progress of Inventions. See in this volume the readings in Archæology, page 115, and also the chapter entitled *The Inventor*, page 242.

12. The Steam Engine. Consult the Index volume; refer also to the chapter in this volume entitled *The Machinist.*

13. War and Peace. Refer to the chapter in this volume entitled *The Soldier.* See International Peace, XIII. 197. Consult Index volume.

14. Slavery. See special article, XXII. 129; ancient slavery, XIX. 348; negro, XVII. 319. Consult Index volume. Read about Wilberforce, XXIV. 565; Clarkson, V. 813; Garrison, X. 85; Wendell Phillips, 1230 sup.; John Brown, IV. 385; history of emancipation, 641 sup.

15. Socialism. Consult Index volume. See also 75 sup. Read about Robert Owen, XVIII. 87; Fourier, IX. 489; Saint-Simon, XXI. 197; Rodbertus, XX. 616; Proudhon, XIX. 867; the Shakers, XXI. 736; the Oneida Community, XVII. 772.

16. Taxation. See references in this volume, page 240.

17. The Origin of Language. See VIII. 769; consult Index volume under the headings, Language and Philology. See references in this volume, page 78.

18. Land Tenure. Consult Index volume. See Adam

Smith, XIX. 367; Ricardo, XIX. 374; Henry George, X. 742.

19. Law in Ancient Times. Consult the references concerning the history of laws, in this volume, page 202.

20. Feudalism. Consult Index volume. See Knight, XIV. 110; Castle, V. 197; Tournaments, XXIII. 489; Chivalry (Index); Homage, XII. 107, etc.

21. The Revival of Learning. See Renaissance, XX. 380. Consult Index volume.

22. The Art of Printing. See references in the chapter entitled *The Printer and the Publisher*, in this volume.

23. Newspapers. See references in the chapter entitled *The Journalist*, in this volume.

24. Perseverance Leads to Success. For illustrations of this truth, see the biographical references in this volume, page 36.

25. Education in Greece and Rome. See the references in this volume, page 250.

26. Great Educators. See the references in this volume, page 250.

27. The Science of Education. See the references in this volume, page 254.

28. Famous Institutions of Learning. See the references in this volume, page 253.

29. The Progress of Medical Science. See the historical and biographical references in the chapter entitled *The Physician*, in this volume. Consult Index volume.

30. Music and Musicians. See the references in the chapter entitled *The Musician*, in this volume.

31. The Discovery of America. See VI. 173; X. 180; XI. 171; Icelandic discoveries, XII. 624; early knowledge of, X. 178; original inhabitants, XVI. 206; origin of name America, X. 182, and XXIV. 192. See also the references on pages 52, 53 of this volume.

32. Great Americans. See the biographical references in this volume, page 30.

33. Washington and Lafayete. Consult Index volume. See references to great Americans, page 30.

34. Hamilton and Burr. See 371 sup.; XI. 412; XXIII. 756; XIX. 384; XI. 413.

35. Great American Orators. See the biographical references on page 231, of this volume.

36. The Invention of the Telescope. Consult Index volume.

37. The Telegraph and the Telephone. See the references in the chapter entitled *The Electrician*, page 169 of this volume.

38. Astrology. See the references given on page 138, of this volume.

39. The Philosopher's Stone. See the references given under *Alchemy*, in this volume, page 137.

40. The Progress of Chemistry. See special article, V. 459. Consult Index volume.

41. The Air we Breathe. Consult Index volume; also see Atmosphere, Oxygen, Respiration, Ventilation, Asphyxia.

42. Water and its Uses. Consult Index volume.

43. Curious Facts About Trees. See the references in the chapter entitled *The Woodsman*, in this volume.

44. The Solar System. See the references on page 85, of this volume.

45. The Moon. Consult the Index volume.

46. The Worship of the Sun. By the Greeks, II. 185; by the Phœnicians, XVIII. 802; by the Sabaeans, XXIV. 741; at Heliopolis XIX. 91; at Baalbec, III. 177.

47. The Fire Worshipers. See XXIV. 193; XVII. 158; XI. 679; XIX. 807.

48. The American Indians. Consult Index volume.

49. African Explorations. Consult Index volume.

50. The Arctic Regions. See II. 478; XIX. 315; X. 190; IX. 721; 133 sup.

51. The Gulf Stream. Consult Index volume.

52. Great Rivers. See the references on page 103, of this volume.

53. Our Government. See the references in the chapter entitled *The Statesman*, in this volume.

54. Monarchy. Consult Index volume; also see references on page 235, of this volume.

55. The Mongol Races of Asia. Consult Index volume.

56. China and Japan. Consult Index volume.

57. Buddha and Buddhism. Consult Index volume.

58. Missions. See the references on page 227, of this volume.

59. Idolatry. See XII. 698, 710.

60. Mohammedanism. Consult Index volume.

61. The Jews. Consult Index volume. See also *Readings for Bible Students*, page 123, of this volume.

62. The Gipsies. Consult Index volume.

63. The Moors in Spain. See in Index volume the following subjects: Spain, Arabs, Moors, Alhambra, Granada, Ferdinand and Isabella.

64. The Turks. Consult Index volume.

65. The Battle of Hastings. See the following subjects in Index volume: William the Conqueror, Normans, Harold, Hastings, Battle.

66. Trial by Ordeal. See XVII. 818.

67. Trial by Jury. Consult Index volume.

68. The Knights Templars. See Templars, in Index volume.

69. Poetry. Consult Index volume.

Consult Index volume for valuable references to the following subjects:

70. Chaucer, the father of English poetry.

71. Milton and Dante.

72. Shakespeare's Dramas.

73. The Greek Drama. See also references on page 70, of this volume.

74. Pope and Dryden.

75. Addison and the Spectator.

76. Dr. Samuel Johnson.

77. Dictionaries. See also references on page 82, of this volume.

78. History of Agriculture. See also the chapter entitled *The Farmer*, in this volume.

79. Patents. See also the chapter entitled *The Inventor*, in this volume.

80. Copyright. See also 506 sup.

81. Books, and how they are made. See also the chapter entitled *The Printer and the Publisher*, in this volume.

82. On Costume.

83. On Commerce. See also the chapter entitled *The Merchant*, in this volume.

84. On Exercise. See Athletic Sports, Health, Gymnastics, Calisthenics, etc.

85. On Games and Amusements. See also the references on page 45, of this volume.

86. Domestic Animals. See Horse, Dog, Cat, Sheep, etc.; also the references on pages 43, 44, of this volume.

87. The Animal Kingdom. See also the Readings about Animals, page 91, of this volume.

88. Labor and Capital. See also the references on page 240, of this volume; also XXIII. 500, and 960, 961 sup.

89. Great Guns. See Guns and Gunnery, 803 sup., also the referenees on page 282, of this volume.

90. Invention of Gunpowder.

91. War. See also the chapter entitled *The Soldier*, in this volume.

92. Stories of Old Greece. See *Legends*, page 132, of this volume.

93. Myths of the Old World. See the references on page 130, of this volume.

94. The Greatest Books. See the references on page 74, of this volume.

95. The World's Great Thinkers. See the biographical references on page 118, of this volume.

96. Great Reformers. See references on page 227, of this volume.

97. The Work of the Farmer. See the chapter in this volume entitled *The Farmer*.

98. Famous Merchants. See references on page 157, of this volume.

99. The Trade of the World. See references on page 155, of this volume.

100. Superstition. See page 139, of this volume.

CHAPTER XLII.

THE PRINTER AND THE PUBLISHER.

"Once invent Printing, you metamorphosed all Universities, or superseded them."—*Thomas Carlyle.*

I. TYPOGRAPHY.

ONE of the most interesting articles in the *Encyclopædia Britannica* is that which relates to the history of printing, volume XXIII., pages 681–696. Here we have an account of the first attempts at printing, which antedated the time of Gutenberg and of Caxton by many years, if not by many centuries. Then follow chapters on block printing, page 682; on the old block books of German origin, page 683; on the work of Gutenberg at Mainz, page 684; on the invention controversy, page 687; on the history of the earliest types, with fac-similes, page 693, etc. In connection with the reading of this article references may be made to the following articles:

Invention of Printing.

Great Printers.

John Gutenberg, XI. 336.
Johann Faust, IX. 853.
William Caxton, V. 279; books printed by him, VIII. 413.
Aldus Manutius, XV. 512, 514. Aldine editions, 76 sup.
Christopher Plantin, XIX. 176.
Elzevir, VIII. 156.
Jodocus Badius, III. 228.

Stephens, or Estiennes, XXII. 534.

The history of modern types, XXIII. 695, next claims our attention. The Italic type, first used by Aldus Manutius, is said to be an imitation of the handwriting of Petrarch. The origin of all other types in common use is explained in this chapter, which closes with a complete list of works on the invention, progress, and process of printing.

Types.

The latter half of the article on Typography, XXIII. 697, is devoted to the discussion of practical printing. Here are separate chapters on type-setting or composing, page 700; on stereotyping or electrotyping, page 702; on press-work and presses, page 704; on color printing, page 708; on artistic printing, page 709; on the departments of a printing establishment, page 710. In connection with this part, refer to the articles, ENGRAVING, VIII. 439, and LITHOGRAPHY, XIV. 697. The following articles also contain additional information on subjects connected with the printers' art:

Latest forms of printing presses, 1271 sup.
Type for the blind, 300 sup., and III. 827.
Lithographic presses, XIV. 1012.
Invention of stereotyping, X. 127.
Electrotypes, VIII. 115.
Richard M. Hoe, 847 sup.

Presses.

II. BOOKS.

See the special article on BOOKS, IV. 37.
Constituent parts of books, III. 652.
Ancient forms of books, XVIII. 144.
Material of ancient books, IV. 37, 38.
Early printed books, III. 652.
Rare and curious books, III. 654.
Anonymous and pseudonymous books, III. 657.

Old Books.

Condemned and prohibited books, III. 658.
Bookbinding, IV. 41.
Albums, I. 456.
Almanacs, I. 590.
Annals, II. 60.
Anthologies, II. 103.
Encyclopædias, VIII. 190.

Libraries. Libraries, XIV. 509; libraries in the United States, 993 sup.; library of Congress, 1557 sup.; Sir Thomas Bodley, III. 848; Sir Robert Bruce Cotton, VI. 509; Magliabechi, XV. 217; Dibdin, VII. 172; bibliomania, III. 655.

Bookselling, IV. 39.

Book trade in Europe, X. 472.

Copyright. Copyright, VI. 356; English laws of copyright, XIV. 541; international copyright, I. 720, and 506 sup.

CHAPTER XLIII.

THE JOURNALIST.

"We read nowadays in the market place—I would rather say in some large steam factory of letter-press where damp sheets of new print whirl round us perpetually."—*Frederic Harrison.*

AN entertaining and valuable article on newspapers is contained in the seventeenth volume of the *Britannica*, pages 412–437. The history of journalism in Great Britain is given at length and is followed by an account of the newspapers of other European countries. The newspapers of the United States is the subject of an interesting and appreciative chapter, XVII. 433–437. In a supplementary article on JOURNALISM, 937 sup., a sketch is given of the methods pursued in the publication of a great American newspaper, and some hints are presented with reference to the qualifications of the successful journalist.

History of Journalism.

Several other articles in the *Britannica* relate directly or indirectly to this important subject. Among these, the following are especially interesting:

Acta Diurna, I. 128.

Reporting, XX. 404, XXI. 841.

Advertisements, I. 177, 37 sup.

Printing of newspapers, XXIII. 703, 709.

Laws relating to newspaper press, XIX. 710.

Benjamin Franklin, IX. 711; his connection with American journalism, XVII. 433.

Horace Greeley, XI. 160, XVII. 434.
James Gordon Bennett, III. 574.
Henry T. Raymond, 1314 sup.
George Ripley, XX. 567.

PERIODICALS, XVIII. 535; history of British periodicals, page 536; of French periodicals, page 539; of American magazines and reviews, page 544.

See, also, the chapters in this volume entitled respectively, *Readings in the History of Literature*, page 64, and *The Writer*, page 255.

CHAPTER XLIV.

THE MUSICIAN.

"Such sweet compulsion doth in music lie."—*Milton.*

"Music is that one of the fine arts which appropriates the phenomena of sound to the purposes of poetry. It has a province of its own in many respects analogous to, but yet wholly distinct from, that of each of the other arts."

IN the seventeenth volume of the *Encyclopædia Britannica* (pages 77–102), Professor Macfarren, of the University of Cambridge, presents a scholarly and comprehensive history of music, tracing its progress through western civilization and showing how it has been changed from an artificial or calculated form to a natural or spontaneous. This article not only appeals especially to musicians and students of music, but it contains much that will interest the casual reader. It may be taken as the basis of a short course of study on this subject. It may be read in sections in connection with other special articles, as follows:

History of Music.

Origin of musical instruments, page 77. (See list of musical instruments below.)

Musical intervals, XVII. 78, 103.

Affinity of music to astronomy, XVII. 78. See Pythagoras, XX. 137.

Antiphony, XVII. 79; also II. 134.

Scales, XVII. 80.

Harmony, XVII. 81. Special article on, VII. 593. The principles of harmony are treated still further in part IV. of the article Acoustics, I. 107.

Harmony.

Counterpoint, XVII. 82.

Academies of music, XVII. 83. See also ACADEMY, I. 78, and CONSERVATORY, VI. 291.

Troubadours, XVII. 83; also VII. 413; Minstrel, XVI. 479.

Madrigal, XV. 192.

Oratorio, XVII. 85–100; also Handel's, XI. 435; Haydn's, XI. 549; Mendelssohn's, XVI. 8.

Hymns, XVII. 85; also the special article on this subject, XII. 577.

Choral tunes, XVII. 85.

Opera, XVII. 87, 99. See Scarlatti, XXI. 375; Lully, XV. 63; Wagner, XXIV. 313.

Cantata, XVII. 88.

Symphony, XVII. 95.

Among the many other articles on musical subjects the following are of especial interest:

Voice, and vocal music, XXIV. 273.

Plain song or chant, XIX. 168.

Vocal Music.

Anthem, II. 102.

Agnus Dei, I. 284.

Almai (Egyptian singers), I. 592.

Glee, X. 677.

Minuet, XVI. 492.

Scientific basis of music, XVII. 102–106 (a scholarly article by Professor Bosanquet, of the Royal College of Music, London).

MUSICAL INSTRUMENTS.

Drum, VII. 479.

Flute, IX. 350.

Transverse Flute, XXIII. 519.
Flageolet, IX. 351.
Bassoon, III. 425.
Lyre, XV. 113.
Aeolian harp, I. 182, and 39 sup.
Harp, XI. 488.
Lute, XV. 70.
Violin, XXIV. 242.
Hornpipe, XII. 171.
French Horn, XII. 167.
Oboe or Hautboy, XVII. 705.
Trumpet, XXIII. 592.
Trombone, XXIII. 586.
Ophicleide, XVII. 705.
Organ, XVII. 828–839.
Pianoforte, XIX. 64–78.

MUSICIANS AND COMPOSERS.

These are so numerous that we shall attempt to name only a few of the most famous. Reference to others may easily be made by consulting the Index volume.

Beethoven, III. 504.
Handel, XI. 433.
Haydn, XI. 538.
Czerny, VI. 755.
Jennie Lind, XIV. 662.
Adelina Patti, 1210 sup.
Liszt, 1012 sup.
Lully, XV. 63.
Mendelssohn, XVI. 6.
Meyerbeer, XVI. 222.
Moschelles, XVI. 855.
Paderewski, 1187 sup.
Rossini, XX. 860.

Scarlatti, XXI. 375.
Wagner, XXIV. 313.
Weber ("creator of romantic opera"), XXIV. 467.

Violin. Paganini, XVIII. 134.
Corelli, VI. 394.
Ernst, VIII. 527.
Ole Bull, 364 sup.

Violin makers: Stradivari, XXIV. 245; Amati, I. 654.
See Cremona, VI. 567 and XVII. 98.

CHAPPER XLV.

THE ARTIST.

"I know many persons who have the purest taste in literature, and yet false taste in art, and it is a phenomenon which puzzles me not a little; but I have never known any one with false taste in books and true taste in pictures."—*Ruskin.*

I. PAINTING.

A GENERAL examination of the place of painting among the FINE ARTS will be found in the article under that heading, volume IX. page 206. But the most interesting and by far the most valuable article on this subject is that entitled: SCHOOLS OF PAINTING, XXI. 433–448. This article may be read by sections, with collateral references to other articles and to the notices of individual painters, as indicated below:

Schools of Painting.

1. Classical School of Painting.

For the early history of painting among the Greeks and Romans, see Volume II. pages 353, 358, 363, 366.

See also Zeuxis, XXIV. 783; Parrhasius, XVIII. 321; Sicyon, II. 349; Apelles, II. 169.

2. Italian School of Painting, XXI. 433; Giotto, X. 609; Masaccio, XV. 605; Fra Lippo Lippi, XIV. 685; Sandro Botticelli, IV. 165; Michelangelo, XVI. 229; Andrea del Sarto, XXI. 315; Giorgio Vasari, XXIV. 94; Raphael Sanzio, XX. 274; Leonardo da Vinci, XIV. 455; Salvator Rosa, XX. 846; Titian, XXIII. 413.

3. German School of Painting, XXI. 438; Hans Holbein, XII. 53; Albrecht Dürer, VII. 554; Hans Holbein, the younger, XII. 54; Anton Raphael Mengs, XVI. 10; Julius Schnorr, XXI. 416; Johann Fried. Overbeck, XVIII. 76; Wilhelm von Kaulbach, XIV. 16.

4. Flemish School of Painting, XXI. 438; Van Eyck, VIII. 814; Van der Weyden, XXI. 439; Hans Memling, XV. 846; Quintin Matsys, XV. 620; Antonio Moro, XVI. 840; Rubens, XXI. 41; Vandyck, XXIV. 59.

5. Dutch School of Painting, XXI. 439; Ruysdael, XXI. 114; Vandevelde, XXIV. 59; Paul Potter, XIX. 600; Hobbema, XII. 30; Rembrandt, XX. 373.

6. Spanish School of Painting, XXI. 440; Zurbaran, XXIV. 829; Velasquez, XXIV. 132; Murillo, XVII. 55; Goya, XI. 22; Fortuny, XXI. 443.

7. French School of Painting, XXI. 440; Nicolas Poussin, XIX. 649; Claude Lorrain, V. 814; Watteau, XXIV. 414; Claude Vernet, XXIV. 168; Prud'hon, XX. 1; Horace Vernet, XXIV. 169; Delaroche, VII. 41; Rousseau, XXI. 22; Millet, XVI. 321; Regnault, XX. 346.

8. British School of Painting, XXI. 441; Hogarth, XII. 47; Sir Joshua Reynolds, XX. 502; Gainsborough, X. 15; Richard Wilson, XXIV. 593; Paul Sandby, XXI. 257; Sir Henry Raeburn, XX. 218; Benjamin West, XXIV. 505; William Blake, III. 804; Eastlake, VII. 615; Copley, VI. 347; Sir Edwin Landseer, XIV. 280; J. M. W. Turner, XXIII. 663; Dante Gabriel Rossetti, XX. 857; Burne-Jones, 370 sup.

Materials used in Painting, XVIII. 137.

Kinds of Painting.

Painting in water colors, XVIII. 139, and XIX. 86.

Enamel—On metal, VIII. 182; in jewelry, XIII. 679; in pottery, XIX. 601.

Encaustic Painting, VIII. 185.

Fresco, IX. 769; Raphael's frescos, XX. 278.
Glass Painting, X. 667.
Aureola, III. 89.
Tempera, XXIII. 157.
Illumination, XII. 707.
Mural Decoration, XVII. 34–48, (a beautifully illustrated article). Wall-painting is treated on pp. 39–48.
Miniatures, XVI. 437.

II. SCULPTURE.

History of Sculpture.

For the history of Greek and Roman sculpture, see the article on CLASSICAL ARCHAEOLOGY, II. 343. Also, Phidias, XVIII. 733; Polycletus, XIX. 416; Scopas, II. 360; Praxiteles, XIX. 660; Lysippus, XV. 120; Arcesilaus, II. 326.
The Æginetan sculptures, 38 sup.
Assyrian sculpture, III. 190.
Etrurian art, VIII. 639.
Early Christian sculpture, XXI. 556.
English sculpture, XXI. 557; John Flaxman, IX. 298; Francis Chantrey, V. 395; Alfred Stevens, XXI. 561; Sir Frederic Leighton, 986 sup.
French sculpture, XXI. 562; Jean Antoine Houdon, XII. 314; François Rude, XXI. 50; David, VI. 842.
German sculpture, XXI. 564; Vischer, XVII. 633; Schlüter, XXI. 566; Albert Wolff, XXI. 566.
Spanish sculpture, XXI. 566.
Italian sculpture, XXI. 567; Pisani, XIX. 122; Donatello, VII. 350; Orcagna, XVII. 814; Ghïberti, X. 566; Michelangelo, XVI. 230; Raphael, XX. 281; Giovanni da Bologna, XXI. 569; Benvenuto Cellini, V. 294; Bernini, III. 604; Canova, V. 24.
Venetian sculpture, XXIV. 156; Veronese, XXIV. 172.

Scandinavian sculpture, XXI. 570; Thorwaldsen, XXIII. 315.

American sculpture, 1403 sup.; Hiram Powers, XIX. 650; Thomas Crawford, VI. 554; Horatio Greenough, XI. 173; Henry Kirke Brown, I. 352; W. W. Story, 1404 sup.; J. Q. A. Ward, 1611 sup.; Harriet Hosmer, 860 sup.; Augustus St. Gaudens, 1371 sup.

Technical methods of sculpture (how a piece of statuary is made), XXI. 571.

Alto Relievo, I. 643.

Relief, IX. 205; Relief in wall decorations, XVII. 34; Relations of sculpture to the Fine Arts, IX. 205.

III. POTTERY, ETC.

The special article on this subject, XIX. 600–643, is one of much interest, amply and beautifully illustrated.

Pottery and Porcelain.

Prehistoric pottery, XIX. 602.
Egyptian pottery, XIX. 603.
Assyrian, XIX. 604.
Phœnician, XIX. 605.
Hellenic, XIX. 611.
Etruscan, XIX. 615.
Græco-Roman and Roman, XIX. 617.
Persian and Moslem, XIX. 619.
Teutonic and Saxon, XIX. 623.
Mediæval, XIX. 624.
Majolica ware, XIX. 624.
Spanish and Portuguese, XIX. 628.
French, XIX. 629.
Bernard Palissy, XVIII. 186.
Mediæval German ware, XIX. 630.
English, XIX. 631.
Josiah Wedgwood, XXIV. 476.

Ancient Mexican ware, XIX. 633.
Chinese porcelain, XIX. 633.
Sevres ware, XIX. 637.
Dresden ware, XIX. 639.
English porcelain, XIX. 640.
Terra cotta, XXIII. 190; Assyrian terra cotta, II. 399; Etruscan, VIII. 641; Japanese, XII. 599.
Tiles, XXII. 387; encaustic tiles, VIII. 187; for wall-linings, XVII. 36.
Mosaic work, XVI. 849; of Egyptians and Romans, XVI. 850; of the Middle Ages, XVI. 852.

IV. METAL WORK.

Metal work as an ornamental art, XVI. 71.
Metal work of Greece, XVI. 73.
Brasses and Bronzes. Of Italy, XVI. 74.
Of England, XVI. 76.
Of Germany, XVI. 77.
Brasses, IV. 219; VII. 694.
Bronze work, XVI. 71,
Japanese bronze work, XIII. 591.
Chinese bronze work, IV. 366.
Venetian bronze work, XXIV. 156.
Iron work in architecture, II. 466.
Hammered metal work, XVI. 72.
Damaskeening, VI. 793.

V. WOOD WORK.

Wood carving XXIV. 644 (a six-page illustrated article, treating mainly of ancient and mediæval work).
Wood Carving. Wood carving in Switzerland, XXII. 779.
Buhl work, IV. 446.
Inlaying, XIII. 81.
Marquetry, IX. 849.

VI. PHOTOGRAPHY.

Special article on Photography, XVIII. 821, with supplement giving an account of the most recent improvements and discoveries, 1230 sup.; see also:

Progress of Photography.

Daguerre, VI. 761.
Niepce, XVII. 495.
Photogravure, XXII. 717.
Photo-engraving, XVIII. 834.
Camera, IV. 740, 741; XVIII. 839.
Instantaneous photography, 1233 sup.
Woodburytypes, Albertypes, 1233 sup.
Artotypes, Heliotypes, Collotypes, Leimtypes, photo-lithographs, ink-photos, 1234 sup.
Zincotypes, typo-gravures, goupil-gravures, etc., 1235 sup.

VII. ENGRAVING.

Special article on Engraving, VIII. 435. Wood engraving, VIII. 436; early engraving on wood, V. 99; in time of Albrecht Dürer, VII. 554; Bewick, III. 621.

History of Engraving.

Copper and steel plate engraving, VIII. 439; Mantegna, XV. 501; Audran, III. 70; Ferdinand Gaillard, VIII. 443.
Etching, VIII. 443.
Mezzotint, VIII. 445.

VIII. MISCELLANEOUS.

Drawing, VII. 446–451. Beginning on page 448, the article is an interesting and very readable critique on the art of delineation as practiced by different artists, and in different countries.

Drawing.

Silhouette, 1430 sup.; caricature, V. 103.
Illumination of written or printed texts, XII. 707; illu-

minated borders of books, XXIII. 696; illuminated manuscripts, VI. 45, XII. 707.
Silhouette, 1430 sup.
Ornamentation. Arabesques, I. 233.
Embossing, VIII. 160.
Stamped leather for wall decoration, XVII. 37.
Embroidery, VIII. 160.
Gilding, X. 593.
Lacquer work, XIV. 194.
Lapidary, XIV. 298.
Cameo, IV. 738; cameos of mediæval times, IV. 739.
Work in ivory, XIII. 520.
Jewelry, XIII. 675–679.

CHAPTER XLVI.

THE SOLDIER.

"In books we find the dead as it were living; in books we foresee things to come; in books warlike affairs are methodized; the rights of peace proceed from books."—*Richard de Bury.*

AMONG the many articles in the *Britannica* which are of especial interest to the soldier, perhaps there is none of greater practical value than that on War, XXIV. 343–366. This is, in short, a comprehensive treatise on the effective organization and employment of armies in active warfare. To officers in the military service its importance will be at once apparent. The first section of the article is of an historical character, and will appeal to the interest of the non-military reader, as well as to that of the soldier. Other sections relate to strategy, page 349, infantry tactics, page 354, cavalry tactics, page 358, and artillery tactics, page 359. It concludes with a special chapter on naval strategy and tactics, page 363.

War.

The article ARMY, II. 559–619, is of no less interest. The history of the armies of ancient and mediæval times, which occupies the first four pages, is of importance to every student. This is followed by other historical sections equally valuable, as, Modern armies, page 563; the British army, page 568, etc. The great armies of the world are each described in a separate chapter:

The Army.

British army, II. 572.
German army, II. 593.
French army, II. 600.
Austrian army, II. 604.
Russian army, II. 608.
Italian army, II. 612.
Other European armies, II. 614.
Army of the United States, II. 619, with a supplementary article giving the latest statistics, 143 sup.
Army regulations, II. 147.
Other articles relating to the profession of arms are as follows:

The Profession of Arms.

Arms and armor (a very interesting historical article, with illustrations), II. 553–558.
Militia, XVI. 299, with a brief supplementary article relating especially to the militia of the United States, 1079 sup.
Cavalry, V. 261.
Artillery (special article with reference to this branch of warfare), II. 655.
Battery, III. 443.
Military academies in the United States, 1078 sup.
Military law, XVI. 295.
Aldershott camp, I. 474.
Ambulance, I. 665.
Ammunition, I. 744.
Archery—warfare with bows and arrows, II. 371.
Armada, II. 543.
Armistice, II. 552.
Arsenal, II. 632; smokeless ammunition, 1441 sup.
Barracks, III. 390.
Battle, III. 443–445.
Military costumes, VI. 477.
Enlistment, VIII. 446.

Fortification, IX. 421–468 (with index on page 468).
Gendarmerie, X. 142.
German army, present status of, 749 sup.; German navy, 750 sup.
Gunnery, XI. 297–315, and 803 sup.
Legion of Honor, XIV. 417.
Parole, 1204 sup.
Pontoon, XIX. 456.
Greek fire, XI. 159.
Roman equites, VIII. 509.
Feudal military service, XIV. 114.
Knighthood, XIV. 110.
Gentlemen-at-arms, 742 sup.
Military tactics of the Arabs, II. 253.
Condottiere, VI. 256.
History of the sword, XXII. 800.

FIFTY FAMOUS BATTLES.

Great Battles.

Marathon (490 B. C.), XI. 99.
Thermopylae (480 B. C.), XI. 100.
Salamis (480 B. C.), XXI. 205, XI. 100.
Cunaxa (401 B. C.), VI. 753.
Arbela (331 B. C.), I. 482.
Caudine Forks (321 B. C.), XX. 742.
Drepanum (249 B. C.), XXIII. 522.
Philippi (42 B. C.), XVIII. 746.
Actium (31 B. C.), I. 418.
Siege of Jerusalem (70 A. D.), XIII. 428.
Adrianople (378 A. D.), XXIV. 36.
Châlons-sur-Marne (451 A. D.), V. 378.
Soissons (486 A. D.), IX. 528.
Tours (732 A. D.), V. 428.
Roncesvalles (778 A. D.), XX. 626.
Dunsinane (1054 A. D.), XVIII. 667.

Hastings (1060 A. D.), VIII. 291, XXII. 725.
Evesham (1265 A. D.), XVI. 788.
Bannockburn (1314 A. D.), VII. 683.
Cressy (1346 A. D.), VII. 686.
Poitiers (1356 A. D.), VII. 686.
Sempach (1386 A. D.), XV. 40, XXII. 784.
Otterburn (1388 A. D.), XXI. 490.
Agincourt (1415 A. D.), I. 282.
Flodden (1515 A. D.), XIII. 557.
Ivry (1590 A. D.), IX. 564.
Naseby (1645 A. D.), VI. 599.
Worcester (1651 A. D.), VI. 601.
Boyne (1690 A. D.), XIII. 268.
Blenheim (1704 A. D.), III. 126.
Pultowa (1709 A. D.), V. 421.
Culloden (1746 A. D.), VI. 696.
Quebec (1759 A. D.), IX. 590, XXIV. 630.
Lexington (1775 A. D.), XXIII. 740.
Bunker Hill (1775 A. D.), XXIII. 740.
Saratoga (1777 A. D.), XXIII. 744.
Yorktown (1781 A. D.), VI. 428, XXIII. 745.
Hohenlinden (1800 A. D.), III. 132.
Austerlitz (1805 A. D.), III. 132, 444.
Jena (1806 A. D.), XVII. 210.
Waterloo (1815 A. D.), III. 442.
Vera Cruz (1847 A. D.), XXIV. 162.
Balaklava (1855 A. D.), VI. 587.
Siege of Lucknow (1857 A. D.), XII. 810.
Solferino (1859 A. D.), III. 139, IX. 524.
Bull Run (1861 A. D.), XXIII. 775, 777.
Vicksburg (1863 A. D.), XXIII. 778.
Gettysburg (1863 A. D.), III. 444.
Sadowa (1866 A. D.), XIV. 138.
Sedan (1870 A. D.), IX. 627.

SEA FIGHTS.

Spanish Armada (1588 A. D.), II. 543.
Battle of the Nile (1798 A. D.), VIII. 363.
Battle of Trafalgar (1805 A. D.), VI. 146; XVII. 343.
Monitor and Merrimac (1862 A. D.), 142 sup.

SOME GREAT SOLDIERS.

Cyrus the Great, VI. 752.
Alexander the Great, I. 480.
Hannibal, XI. 441.
Scipio Africanus, XXI. 467.
Julius Cæsar, IV. 632.
Charlemagne, V. 402.
Jenghis Khan, XIII. 620.
William the Conqueror, XXIV. 574.
Godfrey of Bouillon, VI. 624.
Saladin, XVI. 588.
Robert Bruce, XX. 592.
The Black Prince, VII. 686.
Earl Warwick, XXIV. 381.
Oliver Cromwell, VI. 597.
Gustavus Adolphus, XI. 333.
Peter the Great, XVIII. 698.
Frederick the Great, IX. 735.
Marlborough, XV. 553.
General Washington, XXIV. 387.
Napoleon Bonaparte (see Index volume).
The Duke of Wellington, XXIV. 493.
Ulysses S. Grant, 774 sup.
Robert E. Lee, XIV. 399.
Count von Moltke, 1095 sup.

CHAPTER XLVII.

THE SEAMAN.

"But a great book that comes from a great thinker—it is a ship of thought, deep freighted with truth, with beauty too."—*Theodore Parker.*

THE subject of greatest importance to all navigators is ships. The history of ship-building, from the first rude efforts of primitive man to the wonderful achievements of the present time, is a topic full of interest to both seamen and landsmen. In the twenty-first volume of the *Encyclopædia Britannica*, page 804, there is a readable and very entertaining article on the development of the ship and of the art of navigation, particularly in ancient and mediæval times. The ships of the Phœnicians, the first race of seafaring men, are further described in XVIII. 804. The ships used by the Greeks in the time of Homer, and also the war vessels, biremes and triremes, used in the earliest sea fights, are noticed at considerable length in the pages which follow. Mediæval merchant vessels are described on page 808.

History of Ships.

Turn next to the history of modern navies, by Lieutenant J. D. Jerrold Kelly, volume XVII., page 279. If you are still further interested in this branch of the subject, read the supplementary article on the Naval Force of the United States, 1113 sup., also the brief article which precedes it on the

Modern Navies.

Naval Academy at Annapolis. Read the article, MARINES, XV. 544.

The very exhaustive article on SHIP-BUILDING, XXI. 809–826, contains much information of general interest.

Ship-building. Read the introductory paragraphs, page 809, the description of the "Great Western" and the "Great Eastern," page 815, the paragraphs on Propulsion, pages 822, 823, and the section on Boat-building, page 825.

The article on ROWING, XXI. 29, will appropriately supplement this section. It gives an account of the boats

Boats and Boating. of early times, of the coracles of the ancient Britons, of the galleys introduced by Alfred the Great, and of the barges of the Norman period. It also relates briefly the history of BOAT RACING, and concludes with a number of practical rules and directions for rowing.

Turn next to the article on Sail, Sail-cloth, Sail-making, XXI. 153, and notice especially what is said about sail-making.

Read the article on SEAMANSHIP, XXI. 589–605. This article embraces a great variety of information relative to

Seamanship. the duties and labors of a seaman: how to make knots, bends, and splices, page 592; how to distinguish and name the spars and rigging of different kinds of vessels, page 594; how to lower rigging and set up stays, page 595; how to cast anchor, page 597; all about mooring swivels, anchors, and cables, page 598, etc. At the end of the article, page 603, there is a complete glossary of terms used by seamen.

The article on laws relating to seamen, XXI. 605–608, is worthy of some attention; and the two articles on Right of Search, XXI. 608, and 1406 sup., are also of interest to seamen. So, too, is MARITIME LAW, XXI. 583.

The article on NAVIGATION, or the art of conducting a ship across the ocean, XVII. 250–277, next claims our attention. The first half of this article contains a good deal of valuable historical information. The latter half is more technical and scientific, and is an exhibition of the theory and art of practical or modern navigation. A more popular course of reading would include the following articles or parts of articles:

Navigation.

Rudder and Helm, XXI. 602.
Anchor, II. 3.
Cable, IV. 621.
Capstan, V. 28.
Bottomry, IV. 167.
Log, XIV. 769.
Buoy, IV. 530.
Sailor's Knots, XIV. 128.
Sounding, XXII. 280.
Naval Signals, XXII. 49.
Mariner's compass, VI. 225, XV. 518.
Sextant, XXI. 724.
Latitude, X. 198, XVII. 251.
Longitude, XXIII. 394, X. 187, 198, II. 751.
Tides, XXIII. 353.
Ocean Currents, X. 283, XVII. 275.
Gulf Stream, III. 19.
Trade Winds, XVI. 143.
Harbors, XI. 455.
Dockyards, VII. 310.
Law of Ports, XI. 471.
Pilot, XIX. 96.
Piracy, XIX. 116.
Privateering, XIX. 764.
Canals, IV. 782; Caledonian canal, IV. 787; canals in

Holland, IV. 788; proposed canals, IV. 792; Panama canal, 1192 sup.
Canoes, IV. 811.
Paper boats, 1193 sup.
Yachting, XXIV. 722.
Lighthouses, XIV. 615.
Lifeboat, XIV. 570.
Salvage, XXI. 237.
Tonnage, XXIII. 442.
Admiral, I. 154.

CHAPTER XLVIII.

THE RAILROAD MAN.

"What Mr. Robert Stephenson recently said of the locomotive, at a meeting of engineers at Newcastle, is true of nearly every other capital invention: 'It is due,' he said, 'not to one man, but to the efforts of a nation of mechanical engineers.'"—*Samuel Smiles.*

Evolution of the Railway.

NOT only railroad men but all intelligent readers will be interested in the story of how the modern railway has been developed from the old tramways of two hundred years ago—a story which is briefly but entertainingly told in the twentieth volume of the *Britannica*, beginning on page 223. The article of which this story is the beginning, contains a vast amount of information about railways; railway construction, page 232; railway stations, page 235; engine-sheds and switches, page 237; rails, page 241; locomotives, page 244; carriages and cars, page 247; application of electricity, page 250, etc. The information contained in this article may be variously supplemented from the following:

George Stephenson, XXII. 537.
Locomotive engines, XXII. 520.
Isambard Kingdom Brunel, IV. 396.
Testing railway rails, XIII. 354.
Development of railways in the United States, XX. 253.
The railways of the world, 1302 sup.
Railroad speed, 1309 sup.

Facts concerning railroads in the United States, 1308 sup.

Pacific railways, I. 715.

George M. Pullman, 1291 sup.

Railway Topics.

Railway brake, XX. 240.

The Westinghouse brake, XX. 249.

Railway bridges, IV. 285.

Laws relating to railways, XX. 250.

Law of abandonment, I. 5.

Use of railways in time of war, XXIV. 349.

Electric railways, XXIII. 495.

Atmospheric railways, III. 36.

Express carrying system, 657 sup.

Statistics of railways, 1302 sup.

See now the chapters *The Mechanic*, *The Inventor*, *The Engineer*, *The Machinist*, in this volume, and consult such references under each head as may seem interesting and valuable to you.

CHAPTER XLIX.

THE WOODSMAN.

"Love of trees and plants is safe. You do not run risks in your affections."—*Alex. Smith.*

"The love of knowledge comes with reading and grows upon it."
—*Henry Ward Beecher*

IN this chapter the word woodsman will be used in a broad and somewhat unusual sense. It will include every one who is in any way actively interested in trees and especially in the trees of the forest: First, the man who regards trees only as objects of trade and profit, and views them always from an economical standpoint, caring for them only so far as they are of practical use to mankind; second, those who love trees for their beauty, their fragrance, their grateful shade, their friendship; and third, those who take pleasure in studying them in their scientific aspects, observing their modes of growth and their influence upon climate, soil, and various forms of vegetable and animal life. For all these "woodsmen" the *Encyclopædia Britannica* has a variety of entertaining and trustworthy information.

Forests.

As an introduction to the study of trees, read the article on FORESTRY, 706 sup. Then turn to the very comprehensive article, Forests and Forest Administration, IX. 396–410, and notice the practical character of the information there given. After this, read of the Forests of the United States, XXXIII. 803–807. Another article of much value is that

on ARBORICULTURE, II. 314–324. This, of course, relates especially to the growing of trees as one branch of agriculture. Read particularly the section relating to the culture of trees, II. 315, and the supplementary article on the same subject, 129 sup. Valuable practical suggestions are also given with relation to plantations of forest trees, II. 322 a. For an account of the timbered region of the United States, see 1566 sup. For the forests of Canada, see IV. 773. The climatic influences of forests are discussed in 708 sup.

Of especial interest to lumbermen is the article on SAWMILLS, XXI. 344. An account of the lumber trade in the United States is given in XXIII. 811. The trade in Michigan receives notice in XVI. 238, as also does that of Canada in IV. 774.

Lumbering.

The uses of wood as building material are described in IV. 448; its strength, VIII. 816, and XXII. 603; its value as fuel, IX. 808.

It is of course impossible in this chapter to name all the articles in the *Britannica* that have reference to individual forest trees. It may not be amiss, however, to direct especial attention to the following:

Oak, XVII. 689—an illustrated article very interesting to all lovers of trees; the strength of oak wood, XXII. 603; the use of oak bark for tanning, XIV. 381; the oak in the United States, XXIII. 808.

Timber Trees.

Elm, VIII. 151 b; culture of, II. 317.

Pine, XIX. 102; strength of wood, XXII. 693; pines of California, IV. 704; pines of the Alps, XIX. 102; culture of, II. 316.

Fir, IX. 222; strength of wood, XXII. 603; Scotch pines, XIX. 103.

Boxwood, IV. 181; uses of wood, XXIV. 645.

Rosewood, XX. 851.

Logwood, XIV. 805; XII. 133.

Mahogany, XV. 288; IX. 406; strength of wood, XXII. 603.

Eucalyptus, VIII. 649; XIII. 593; eucalyptus in Australia, XXIV. 216, 508.

The great trees of California are described in IV. 704 and XXI. 673.

Of the trees that are valuable for their products but not valuable as timber, it may be interesting to note the following:

Valuable Trees.

Cinchona (quinine tree), V. 780. Its cultivation in Peru, XVIII. 673; in India, III. 568, and XII. 751; and in the Himalaya mountains, XI. 833.

Caoutchouc (india rubber), IX. 154; XVIII. 673; IV. 226; XII. 835; and IV. 88.

Olive, XVII. 761; III. 59.

Orange, XVII. 810.

Lemon, XVII. 437.

Banana, III. 307; XIX. 176; and XIX. 419.

Mulberry, XVII. 13; and XXII. 58.

But for the common fruit trees see the chapter entitled *The Gardener*, p. 192, of this volume.

COFFEE PLANT, cultivation of, V. 110; in Brazil, IV. 227; in Cuba, VI. 681; in Arabia, II. 237; in Java, XIII. 603; in Ceylon, V. 369.

TEA PLANT, XXIII. 97, and IV. 738; cultivation of in China, V. 636; in India, XII. 750, and III. 568.

Food Plants and Trees.

Cocoa, or Cacao, VI. 100.

Date Palm, VI. 831, XVIII, 190; of Arabia, II. 237.

Fig, IX. 153.

Almond, I. 594.

Aloe I. 597.

Bread Fruit, IV. 243.

Among the curious trees of the world, mention may be made of the Banyan, III. 348; Baobab, I. 268; Bo, or sacred fig tree, IX. 154; Upas Tree, XXIII. 859, and this list might be extended indefinitely.

See now Chapter XXX., *The Gardener*.

Read the chapter on Parks of the World, 1198 sup.; that on the Parks of the Rocky Mountain Region, VI. 161, and XXIII. 796; and the article on NATIONAL PARKS, 1200 sup.

Parks.

In conclusion the reader's attention is directed to the article on ARBOR DAY, 129 sup., and the additional paragraph on the same subject, XII. 848.

The above references are sufficient to indicate the vast amount of curious, interesting and instructive information that may be derived from the *Britannica* with reference to this subject of trees.

CHAPTER L.

THE MINER.

"Excellence is never granted to man but as the reward of labor."
—*Sir Joshua Reynolds.*

MINING, or the process by which useful minerals are obtained from the earth's crust, is treated with great fulness in the *Britannica*. The special article on this subject, XVI. 440–472, is a valuable treatise, amply illustrated with cuts and diagrams, and replete with interesting information for all who are engaged in this branch of industry. It may be read by sections, in connection with collateral references to other articles relating to the different branches of the subject.

Mining.

1. Manner in which the useful minerals occur in the earth's crust, viz., tabular deposits and masses, faults or dislocations, XVI. 440–442.

2. Prospecting, or search for minerals, XVI. 442–443.

3. Boring with rods and ropes—diamond drills, XVI. 443–444.

4. Breaking ground — Tools employed — Blasting—Machine drills—Driving levels and sinking shafts, XVI. 444–449. See also, Blasting, III. 808; XXIII. 662.

Mining Processes.

5. Employment of Labor, XVI. 449.

6. Securing excavations by timber, iron, or masonry, XVI. 449–451.

7. Working away of veins, beds, and masses, XVI. 451–455.

8. Carriage of minerals along underground roads, XVI. 455–456.

9. Raising minerals to the surface, XVI. 456–457.

10. Drainage of mines, XVI. 457–459.

11. Ventilation and lighting of mines, XVI. 459–461.

12. Means of descending and ascending, XVI. 461–462.

13. Preparation of ores, XVI. 462–467.

14. Laws relating to mining, XVI. 466.

15. Accidents in mines, XVI. 466–467.

For statistics respecting the product of the world's mining, and especially the mineral products of the United States, see 1084 sup.

Mineral Products.

For a special account and description of the minerals of any particular country, see the article relating to that country; for instance, if you wish to know what minerals are produced in India, see under INDIA, XII. 764 a. Also note such references as the following:

Minerals of the Appalachian Mountains, II. 201.

Gold and Silver in Bolivia, IV. 13.

Minerals in Borneo, IV. 57.

Minerals in Burmah, IV. 552.

Gold in California, IV. 701.

Minerals in Arabia, II. 244.

Minerals in Australia, III. 109.

Minerals in Cuba, VI. 680.

And hundreds of others of like character.

For interesting historical notes on the discovery and use of certain metals, see METALS, XVI. 63.

Special articles are devoted to all the great minerals, as follows:

COAL, VI. 45–85; classification of coal, VI. 45; origin of, VI. 47; X. 238; anthracite coal of the United States, II. 106, and XXIII. 811; coal-mining, VI. 61 (see Coalfields, in Index volume, XXV. 103); analysis of coal, VI. 80; area of coalfields in the United States, 482 sup. and I. 680.

The Great Minerals.

GOLD, X. 740; gold-mining, X. 745 and IV. 791; gold in the United States, XXIII, 811, 814, and 763 sup.; world's annual product of gold, 1084 sup.; gold mines of America, I. 716.

SILVER, XXII. 69; description of silver, XVI. 382; world's product of silver, 1084 sup.; how silver is mined, XVI. 470.

IRON, XIII. 278; ores of iron, XVI. 58; iron mining in the United States, XXIII. 811; American production of iron, 916 sup.; rolling-mill product of iron, XX. 1352; iron industry in the United States, XXIII. 813; strength of iron, XXII. 603. (See also Index volume, page 226.)

COPPER, VI. 347; copper mining, XVI. 452; production in the United States, XXIII. 816; in Michigan, XVI. 239; copper pyrites, XX. 129; copper smelting, XXII. 733.

LEAD, XIV. 374; production of lead in the United States, XXIII. 817, and 1084 sup.; in Missouri, XVI. 525; lead mining, XVI. 465; description of lead ores, XVI. 383.

ZINC, XXIV. 784; production of zinc in the United States, XXIII. 817, and 1084 sup.; treatment of zinc ores, XVI. 465.

TIN, XXIII 400; ores of, XVI. 58; production in the United States, XXIII. 816; discoveries in corrosion of, 439 sup.; history of mines in Cornwall, VI. 425.

Metallurgy.

Read finally the article on METALLURGY, XVI. 57–62, describing the methods used industrially for the extraction of metals from their ores. See also:

Amalgamation of gold, X. 747; of silver, XXII. 69; mercurial amalgam, I. 652.

Blast furnace, IX. 840.

Assaying, II. 724.

Table of fusibility of metals, XVI. 66.

See the two chapters which follow, *The Mineralogist* and *The Geologist.*

CHAPTER LI.

THE MINERALOGIST.

A COMPLETE description of mineral species, illustrated with numerous diagrams and cuts, is given XVI. 380–429.

Mineral Species.

Very many of the minerals so described are noticed at still greater length in special articles. The following are a few of the most important:

Alabaster, I. 439.
Alum, I. 643; XVI. 402.
Aluminium, I. 647.
Amber, I. 659.
Amethyst, I. 736.
Anthracite, II. 106.
Antimony, II. 129.
Arsenic, II. 634.
Asbestos, II. 675.
Asphaltum, II. 715.
Barytes, III. 406.
Beryl, III. 613.
Bismuth, III. 790.
Bitumen, XVI. 428.
Borax, IV. 50.
Calcite, X. 228.
Calc-Spar, IV. 653.
Calomel, IV. 711.
Carbuncle, V. 89.
Carnelian, I. 277.
Chalcedony, I. 277.
Chalk, V. 372.

Cinnabar, V. 785.
Clays, X. 237.
Coals (see references given in Chapter L.).
Cobalt, VI. 81; XX. 23.
Copper (see references given in Chapter L.).
Copperas, VI. 352.
Diamond, VII. 162; diamond mining, XVI. 455; in South Africa, V. 42; in Brazil, IV. 224; in India, XII. 766; cutting diamonds, XIV. 298.
Emerald, VIII. 170.
Emery, VIII. 171.
Felspar, X. 227.
Flint, IX. 325.
Fuller's earth, IX. 816.
Galena, XIV. 375.
Garnet, VIII. 640.
Gold (see references given in Chapter L.).
Graphite, XVI. 381.
Gypsum, XI. 351.
Hornblende, X. 228.
Hornstone, XVI. 389.
Ice, XII. 611.
Iceland Spar, IV. 653.
Iron (see references given in Chapter L.).
Jasper, XIII. 596.
Jet, XIII. 672.
Kaolin, XIV. 1, 90.
Lead (see references given in Chapter L.).
Lignite, VI. 46.
Limestone, X. 232.
Loam, XVI. 424.
Magnesia, XV. 218.
Manganese (red), XVI. 398.
Marble, XV. 528.

Volcanoes, X. 240.
Earthquakes, VII. 608 (Index vol. page 141).
Rivers, XX. 571.
Lakes, XIV. 216.

Palæontological geology, or the study of organic forms found in the crust of the earth, is the subject of an interesting chapter, X. 319–325. The subject is treated still further in the following articles:

Palæontology.
Distribution, VII. 267.
Birds, III. 728 (see special index, III. 777).
Ichthyology, XII. 666; I. 275.
Ichthyosaurus, XII. 695.

Mammalia, XV. 375 (see special index, XV. 446).
Mammoth, XV. 447.
Fossils of America, I. 682.
Oldest known fossils, IX. 384.

Stratigraphical geology is treated very fully in volume X., pages 325–370.

Archæan rocks, or formation, X. 327.
Palæozoic, X. 328.
Secondary, or Mesozoic, X. 352.
Tertiary, or Cainozoic, X. 360.
Post-Tertiary, or Quaternary, X. 360.

A further study of these subjects will involve references to the following subjects:

Coal, VI. 45.
Coalfields and coal-mines (see Index volume, page 103).
Coalfields of America, 482 sup.

Practical Geology.
Caves, V. 265.
Glaciers (see Index volume, page 183).
Artesian wells, II. 644.

Petroleum, XVIII. 712, 237.
Natural gas, XXIII. 813.
Man· icles which will suggest themselves to the

reader as he pursues this study, may be found by reference to the Index volume.

In studying the history of the science of geology you will find the names of a few distinguished men to whose labors and investigations we are indebted for the greater part of our knowledge concerning this subject. It may be of some interest to you to read the story of their lives. Among these, the following are especially noteworthy:

Geologists.
- Sir Charles Lyell, XV. 101.
- Hugh Miller, XVI. 319.
- William Buckland, IV. 420.
- Sir Roderick Murchison, XVII. 50.
- John Phillips, XVIII. 758.
- William Smith, XXII. 178.
- James D. Dana, 539 sup.
- Alexander Winchell, 1630 sup.

CHAPTER LIII.

THE CHEMIST AND APOTHECARY.

HISTORY OF CHEMISTRY.

THE history of the science of chemistry is told in the fifth volume of the *Britannica*, in the very comprehensive article on that subject, beginning on page 459. The first mention of chemistry is found in the dictionary of Suidas, who flourished in the 11th century (see XXII. 631); he defines it as "the preparation of silver and gold," and all the efforts of the early chemists (whom we now call alchemists) seem to have been directed toward the finding of some method for making gold and silver. From the 11th to the 15th century alchemy was diligently studied by the philosophers of Europe. This period marks the "sickly but imaginative infancy" of modern chemistry (see Alchemy. I. 459). It was Paracelsis who declared that "the true use of chemistry is, not to make gold, but to prepare medicines" (see XVIII. 234). Other famous men who have contributed to the progress of this science are appropriately noticed in the *Britannica*.

Von Helmont (1577–1644), XI. 638.

Glauber (1604–1668), the discoverer of Glauber's salt, X. 675.

Robert Boyle (1627–1691), IV. 184.

F. Hoffmann, XII. 46.

Sir Isaac Newton, who was the first to indicate the nature and modes of formation of gases, XVII. 438 (see Index).

Dr. Stephen Hales (1677–1761), who was the first to describe the air as "a fine elastic fluid," XI. 382.

Dr. J. Priestley (1733–1804), the discoverer of oxygen gas, XIX. 730.

Henry Cavendish (1731–1810), the inventor of the pneumatic trough, V. 271.

Lavoisier (1743–1794), XIV. 252.

Dr. Dalton, originator of the atomic theory, VI. 784.

Gay-Lussac, discoverer of the laws of the combinations of gases by volume, X. 121.

Alexander Von Humboldt, XII. 343.

Justus Liebig, XIV. 565 (see Index).

Michael Faraday, IX. 29.

CHEMICAL ELEMENTS.

All of the more important "elementary or simple bodies" met with in nature are described in special articles in the *Britannica*. Among these are:

Aluminium, I. 647.
Antimony, II. 129.
Arsenic, II. 634.
Barium, V. 525.
Bismuth, III. 790.
Boron, V. 520.
Bromine, IV. 631.
Calcium, XIV. 647.
Carbon, V. 86.
Chlorine, V. 678.
Cobalt, VI. 81.
Copper (see Index volume, page 111).
Gold (see Index volume, page 184).
Hydrogen, XII. 433.
Iodine, XIII. 202.
Iron (see Index volume, page 226).

Lead, XIV. 374.
Magnesium, XV. 217.
Mercury, XVI. 31.
Nickel, XVII. 487.
Nitrogen, XVII. 515.
Oxygen, V. 479.
Phosphorus, XXIII. 815.
Platinum, XIX. 189.
Potassium, XIX. 588.
Silicon, V. 521.
Silver (see Index volume, page 405).
Sodium, XX. 240.
Sulphur, XXII. 634.
Tin, XXIII. 400.
Zinc, XXIV. 784.

A complete list of the elements, so far as now known, is given in V. 647.

For an account of the most recent discoveries, see the American Additions and Revisions, page 437 sup.

A valuable treatise on ORGANIC CHEMISTRY is contained in volume V., beginning on page 544.

THE APOTHECARY.

A brief article, beginning on page 198 of the *Britannica*, gives a history of the practice of pharmacy in England, with some notice of the English laws regulating the sale of drugs and medicines. Another article, on the art of the drug-compounder, may be found under the head of Pharmacopœia, XVIII. 730. For some facts regarding the adulteration of drugs, see I. 175.

See also Medicines (consult Index volume, page 285). Observe the references given in this volume in the chapter entitled *The Physician*.

CHAPTER LIV.

THE HOME MAKER.

"Our books, gardens, family, scenery, might all bring forth to us far greater wealth of enjoyment and improvement if we tried to squeeze the very utmost out of them."—*Charles Buxton.*

"A home without books is like a room without windows."—*Henry Ward Beecher.*

THE *Britannica* would be lacking in completeness if it did not contain a number of practical articles on topics of domestic interest and utility. An examination of any single volume will show that it is not in the least deficient in this respect. To any person having in charge the affairs of a home or a family, this great work offers a variety of useful information that is not to be found in any similar publication.

House-building.

Do you think of building a house for yourself? See the article on Building, IV. 447. Consult, also, the supplementary article on the History of American Architecture, page 131 sup.; and notice the series of plans for dwelling houses, page 135 sup. Then refer to the following valuable articles, or parts of articles:

Sanitation of the house, XII. 567.

Progress in American sanitary science, 1379 sup.

Ventilation of the house, XII. 567; also 1595 sup.

Sewerage, XXI. 711.

Plumbing, IV. 502.

Water closets, XXI. 716.

Uses of Indian corn, 901 sup.
Maccaroni, XV. 125.
Flour, IX. 343.
Nutritive lichens, Iceland moss, etc., XIV. 559.
Curry, VI. 715.
Cinnamon, V. 785.
Nutmeg, XVII. 666 (illustrated).
Allspice, XIX. 97.
Pepper, XVIII. 516; Cayenne, V. 280.
Confectionery, VI. 256.
Aerated waters, I. 184.
Mineral waters, XV. 431.
Ice, XII. 611.

Read the valuable article on dietetics, VII. 200.
Diet in sickness, VII. 205.
The uses of water in dietetics, XXIV. 399.
Dietetics. Meals, VII. 209.
Plutarch on dietetics, VI. 181.
Lord Combermere's rules, VI. 181.
Also the supplementary article on diet, 571 sup.

Household necessities and utensils:
Candles, IV. 802.
Lamps, XIV. 244.
Necessities. Sewing machines, XXI. 718.
Needles, XVII. 313.
Pins, XIX. 97.
Thread, VI. 502.

A long list of articles on miscellaneous subjects might be given here. The following will be sufficient to indicate their number and variety:

Costume: in volume VI., page 453, there is a complete history of dress, with illustrations.

Gloves, X. 692.
Girdles, X. 622.
Shoes, XXI. 830.
Dress. Hats, XI. 518.
Ribbons, XX. 531.
Laces, XIV. 183.
Parasols, XXIII. 722.
Sachets—perfumes, XVIII. 527.

Dyestuffs, VII. 574.
Cochineal, VI. 97.
Kermes, XIV. 49.
Dyeing. Lac dye, XIV. 182.
Lichens, XIV. 559.
Aniline dyes, V. 577.
Logwood, XIV. 805.
Madder, XV. 176.

What to do in case of asphyxiation, II. 716.
Some rules for the care of the sick, VII. 205.

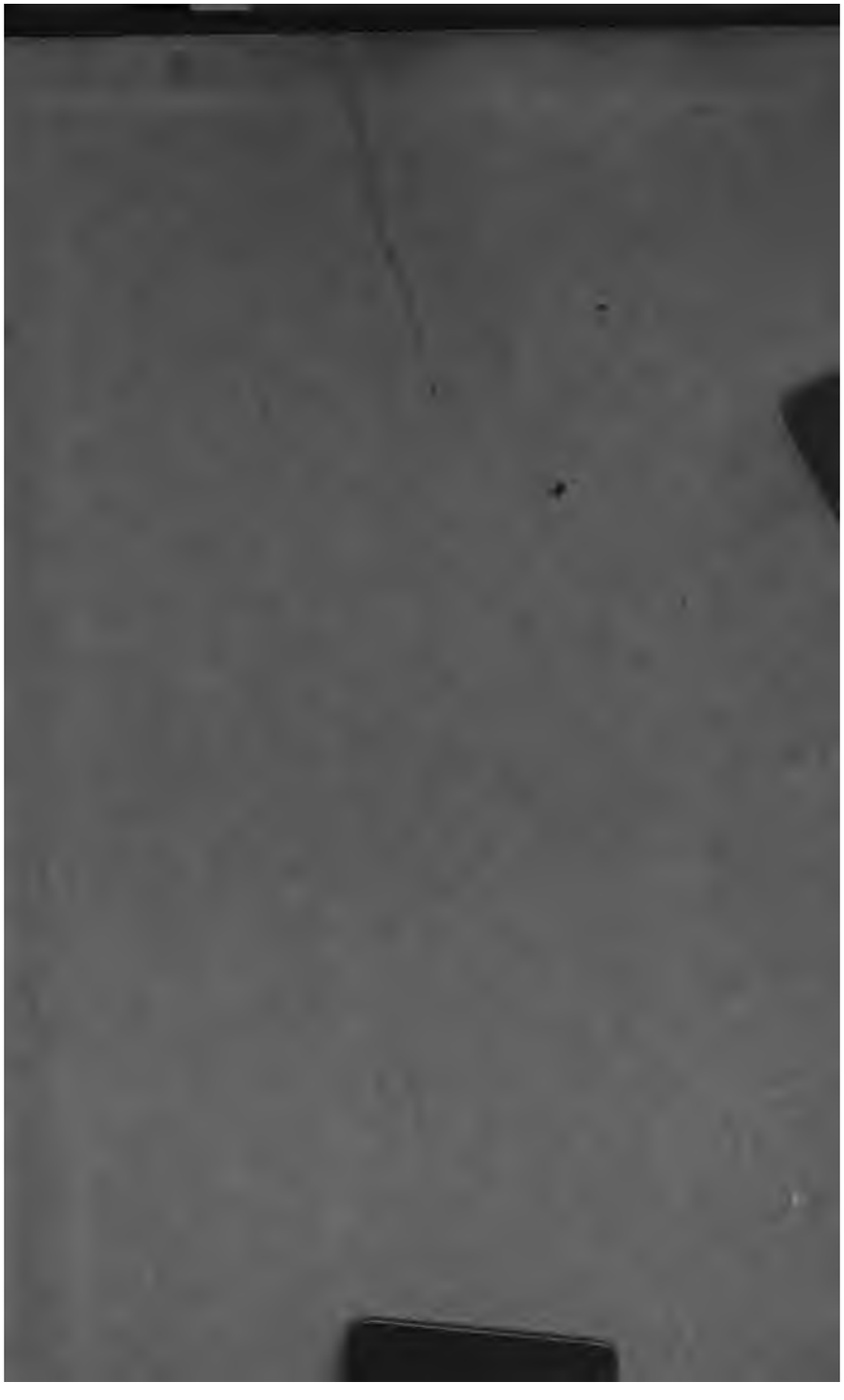
Other topics will suggest themselves to every intelligent housekeeper; and these may generally be found by referring to the Index volume.

See also the chapters in this volume entitled respectively, *The Farmer*, *The Gardener*, *The Physician*, and *The Fruit Grower*.

INDEX.

Adventurers and discoverers, 25.
Aesthetics, 122.
Alchemy, 137.
Algebra, 108.
Almanacs, 87.
American architecture, 161.
American biography, 30.
American history, 52.
American literature, 64.
Americans, Great, 30.
Anatomy, 215.
Ancient history, 54.
Ancient literature, 70.
Ancient pastimes, 47.
Animals, popular readings about, 91, 94; fabled, 43.
Anthropology, 112.
Antiquities, 114.
Apothecary, The, 308.
Archæology, 114.
Archery, 46.
Architect, The, 161.
Arithmetic, 107.
Armies of the world, 281.
Arms and armor, 282.
Artist, The, 274.
Aryan languages, 79.
Astrology, 138, 84.
Astronomy, Readings in, 83.
Athletic sports, 47.
Banker, The, 158.
Battles, Fifty famous, 283.
Beautiful, The science of the, 122.
Bible—the books of, 123; history of, 125; geography of, 127.
Biographical dictionary, condensed, 17.
Biography: American, 30; readings in, for young people, 36; biographies of zoölogists, 90; of mathematicians, 107; of philosophers, 118; of logicians, 121; of botanists, 98; of lawyers, 203; of physicians, 213; of theologians, 225; of patriots and statesmen, 237; of political economists, 241; of great inventors, 243; of famous teachers, 250; of psychologists, 252; of printers, 265; of newspaper men, 269; of great soldiers, 285; of geologists, 305.
Birds, 92, 95.
Boats, 287.
Books, Fifty great, 74.
Books for lawyers, 211; for teachers, 251.
Books, Making of, 266.
Botany, Readings in, 98.
Boys and girls, To the, 21.
Brasses and bronzes, 278.
Bridges, 182.
Builder, The, 165.
Buildings, Famous, 164.
Canals, 156.
Carpenter's work, 166.
Ceremonies, 227.
Cheerfulness, Men of, 39.
Chemist, The, 306.
Chess, 46.
Christian doctrine, 221.
Church government, 229.
Church history, 224.
Classification of the an
dom, 94.
Comets, 86.
Commerce, 154.
Composers, Musical,
Composition, 256.
Co-operation, 100.
Copper and its
Cotton manuf
Courts of law,
Crops, 188.
Curious birds, 42.

Curious customs, 143.
Curious inventions, 141.
Curious things of interest to young people, 23.
Desultory reading, 141.
Determination, Men of, 37.
Dietetics, 311.
Diligence, Men of, 36.
Discoverers and adventurers, 25, 29.
Diseases, 217.
Domestic animals, 43.
Domestic economy, 310.
Drama: Greek, 70; general articles on, 77.
Drawing, 279.
Dress, 312.
Drugs, 308.
Dyeing, 312.
Eclipses, 86.
Education, 249.
Egypt—history, 55.
Electrical phenomena, 171.
Electrician, The, 169.
Encyclopædia, what it is, 22.
Energy, Men of, 38.
English history, 61.
English literature, 67.
Engineer, The, 182.
Essays, Subjects for, 257,
Engraving, 279.
Ethics, 117.
Ethnology, 113.
Explanations — references in the GUIDE, 14.
Fabled animals, 43.
Fables, 136.
Fairy stories, 136.
Family reading circle, 13.
Farmer, The, 185.
Fertilizers, 188.
Fiction, 76.
Finance, National, 160.
Fine arts, 274.
Fishes, 42, 92, 95.
Flax and linen, 148.
Flower garden, The, 193.
Food plants, 294.
Foods, 310.
Forestry, 292.
Fortification, 184.
Free trade, 155.
Fruit grower, The, 195.
Games, sports, and pastimes, 45.
Gardener, The, 192.
Geography, Readings in, 101.
Geologist, The, 303.
Geometry, 108.
Glass and glass-ware, 152.
Gold, 151, 298.
Government, 234.
Grammar, 257.
Greece—history, 56; literature, 70; mythology, 130.
Heat, 246.
Heroes, 24.
History — Home readings for young people, 28; American, 30; naval, 31; romance of, 32; three courses of reading in, 51; ancient, 55; modern, 58; English, 61; Scottish, 62; Irish, 62; of geography, 101; of mathematics, 106; of money, 158; of architecture, 162; of electricity, 169; of law, 202; of medicine, 212; of the church, 224; of education, 249; of printing, 265; of music, 270; of war, 283.
Holy days, 228.
Home maker, The, 309.
Homesteads, 186.
Horticulture, 192.
Houses, Plans for, 168.
How to do things, 26.
How to use an encyclopædia, 22.
Hydromechanics, 179.
Hygiene, 215.
Index volume, How to use, 15.
Insects, 42; injurious, 189.
Inventor, The, 242.
Iron manufactures, 150.
Irrigation, 188.
Israelites — the journey through the wilderness, 127.
Journalist, The, 268.
Kitchen, The, 310.
Labor and wages, 240.
Landlord and tenant, 187.
Landscape gardening, 194.
Language: Readings in the history of, 78; origin of, 112; Aryan language, 79; Semitic and Hamitic, 81.
Law, Maritime, 287.
Law terms, 206.

Lawyer, The, 201.
Leather and leatherwork, 152, 176.
Legends — Greek, 132; English, 135; Christian, 135.
Leisure reading for merchants, 157; for everybody, 141.
Liquors, 232.
Literature—Courses of reading in the history of, 64; American, 65; ancient, 70; English, 67; Roman, 72; fourteen great literatures, 73.
Logic, 121.
Lumbering, 293.
Machinist, The, 178.
Magic, 138.
Magnetism, 171.
Man, Readings in the study of, 111.
Manufacturer, The, 147.
Mason's work, 166.
Materials for building, 166.
Mathematics, 106.
Mechanic, The, 172.
Mechanical laws, 247.
Medicine, 214, 308; history of, 212.
Merchant, The, 154.
Metal work, 175, 278.
Metaphysic, 119.
Meteorology, 247.
Middle ages, The, 33, 59.
Military affairs, 282.
Miner, The, 296.
Mineralogist, The, 300.
Mineral products, manufacture of, 150.
Mining, 296.
Mohammedanism, 58.
Money, 158.
Motors, electric, 171.
Musical instruments, 271.
Musician, The, 270.
Mysticism, 139.
Mythology, 33; readings in, 130.
Natural curiosities, 142.
Navies, 286.
Navigation, 288.
Newspapers, 268.
Northern mythology, 131.
Occult sciences, 137.
Ocean life, 93.
Oceans, The, 102.
Oratory, 230.
Orchards, 195.
Ornamentation, 280.
Painting, Schools of, 274.
Palaeography, 255.
Palæontology, 304.
Parks, 295.
Pasturage, 200.
Pathology, 215.
Patience, Men of, 38.
Paul—the voyage to Rome, 129.
Pedagogy, 249.
Persia—history, 55.
Philology, Readings in, 78.
Philosophy, Readings in, 117.
Photography, 279.
Physician, The, 212.
Physiology, 215.
Plans for dwelling houses, 168.
Pneumatics, 179.
Poetry, 77.
Political economist, The, 239.
Politics, 234.
Pottery, 151, 277.
Poultry, 200.
Precision, Men of, 39.
Printer, The, 265.
Printing, Invention of, 265.
Psychology, 120, 251.
Public speaker, The, 230.
Publisher, The, 265.
Puzzles, 48.
Railroad man, The, 290.
Railways, 290.
Religions, 220.
Remedies, 218.
Reptiles, 42.
Rhetoric, 256.
Roadbuilding, 183.
Roman history, 33, 57; literature, 72.
Sailors, 286.
Schools, 253.
Science, Home readings in, for young people, 41.
Scientists—astronomers, 84; zoölogists, 90 (see Biography).
Sculpture, 276.
Sea animals, 43.
Seaman, The, 286.
Semitic languages, 81.
Shipbuilding, 287.
Ships and shipping, 156, 287.
Silk manufactures, 149.
Silver, 151.

Soils, 187.
Soldier, The, 281.
Statesman, The, 234.
Statistics of manufactures, 153; of agriculture, 189.
Steam engine, The, 178.
Stock raiser, The, 198.
Sun worship, 85.
Supernatural, Readings in the study of the, 137.
Superstition, 139.
Surgery, 215.
Surveying, 182.
Tariff, 155.
Teacher, The, 248.
Telegraph, The, 170.
Temperance, 231.
Textile products, 148.
Theism, 221.
Theologian, The, 219.
Treasury, The national, 160.
Trees—fruit, 195; timber, 293.
Trigonometry, 108.
Typography, 265.
United States—history, 52; geography, 104.
Universities, 253.
Vegetables, 194.
Violins, 273.
War, 281.
Warriors, 25, 285.
Waterworks, 183.
Wild flowers, 194.
Wines, 196.
Witchcraft, 138.
Wood carving, 278.
Woodworker, The, 174.
Woodsman, The, 292.
Wool, 148.
World, View of the, 103.
Writer, The, 255.
Young people's department, 19.
Zoölogy — historical course, 89; popular course, 91; scientific course, 93; young people's course, 41.